

# MODERN PLASTICS

AUGUST 1954

Profit by the DO-IT-YOURSELF MARKET...Page 87

How to Mold Big Reinforced Plastics Pieces — FAST...Page 115

## BEFORE: Cast Metal





Durez take-up drum on "Steno" Wire Recorder Dictation Machine made by Crescent Industries.

## AFTER: Molded Durez



# Could YOU reduce parts cost this way?

Phenolic plastics are more than ever a profitable line of approach to better products . . . and to fabricating economies. New materials developed by Durez are continually widening their usefulness in fields requiring electrical, heat, and impact resistance.

From our files, this example is one that might well be matched in your business — in what you make or propose to make. Seeking to overcome the cost of numerous pre-assembly operations on a precision-balanced turntable (plus a reject problem), this manufacturer solved both problems by switching to a unit of molded Durez. The net result was a saving of 30% in cost installed, with engineering specifications met in all respects.

We can show you how these engineering plastics are used by many leading manufacturers to save operations . . . to improve product performance and appearance. Ask, too, for our monthly "Plastics News" with reports of interesting applications. Write . . .

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# MODERN PLASTICS*

August 1954 • Vol. 31, No. 12

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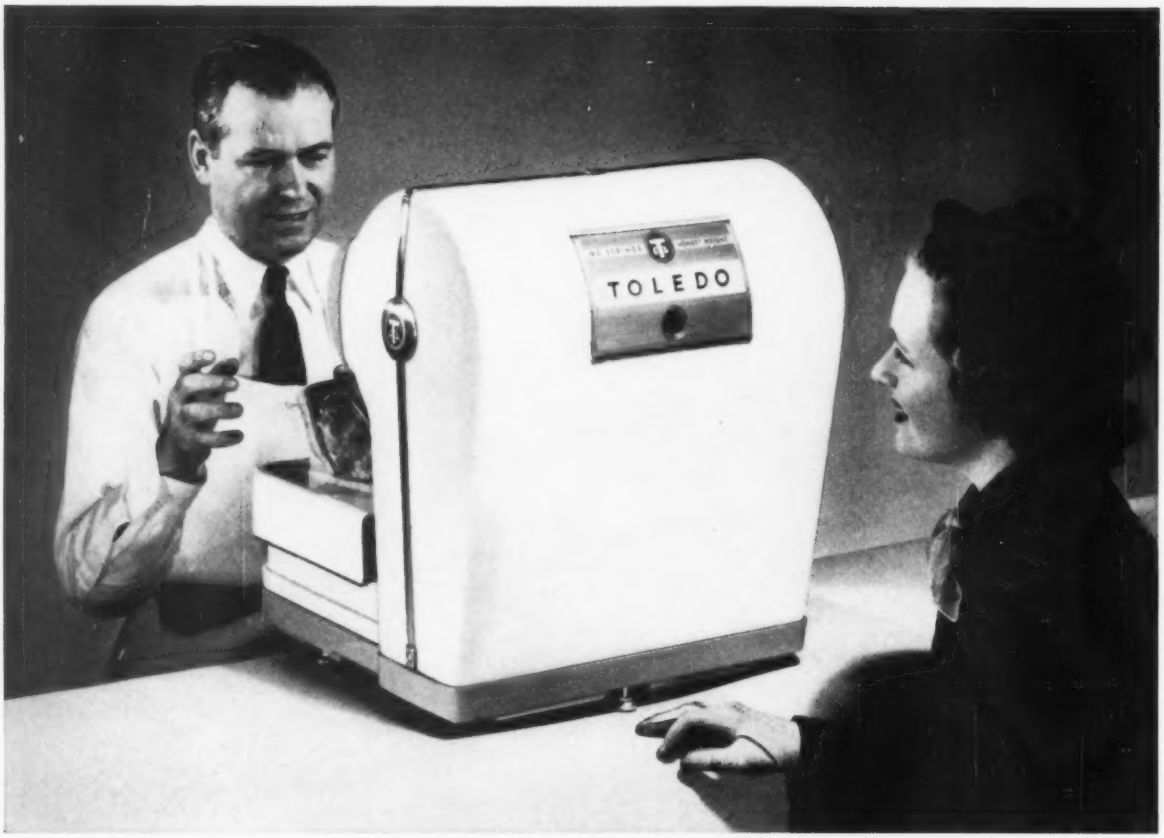
THIS is a part of a 3-mile installation of rigid vinyl plastic pipe in the oil fields of Ellis County, Kansas. It carries hot salt water—a corrosive by-product of crude oil—from a separating tank to a deep disposal well.

Oil company engineers chose *high-impact* rigid vinyl pipe made from Geon resin because it won't corrode, can stand roughest handling and has better chemical resistance. Another advantage: Money is saved in ditching operations for other pipe made of brittle materials must be cradled in a more costly graded ditch to avoid damage.

This high-impact rigid vinyl pipe has so many advantages that it may suggest a use to you or may give you an idea for an equally successful product. There are scores of other uses for Geon materials—from rigid sheets and panels to flexible colorful upholstery, wire insulation, durable flooring, sponge and many more. For information on Geon materials, please write Dept. GB-8, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.




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# EDITORIAL

## The Do-It-Yourself Market

There is an ancient political saying that "the times make the man." A parallel in industry might be "the needs produce the materials."

Our emergent economy, through automation in factories and appliances in homes, is one of increased leisure, higher and higher wages, mobility, and the movement to suburban home ownership.

When a man wants home repair or modernization work done, has time to spare, and can't afford the high wages of carpenters, tile-setters, and painters, he naturally wants to do it himself. No amateur could set ceramic wall tile, but anybody can handle styrene wall tile; no home craftsman could lay rubber flooring, but a child could put down a vinyl floor; no housewife could upholster a chair in leather, but many are doing it quite neatly with vinyl. So the needs of our times are met by plastics.

Our lead feature this month points up the fact that no other single thing is having as much effect in improving public appreciation of plastics as the use and handling of plastics by the public.

Plastics supplement wood and metal in the do-it-yourself market, are more interesting and colorful to use. Opportunities for further development of this field for plastics are tremendous and such development will hasten the day when plastics are fully recognized as basic materials of construction.

Progress in the creation of plastics materials for the home craftsman has been tremendous in the past couple of years. For example, the revolution in adhesives has brought pressure-sensitive positive bonding within the range of any consumer. Tools especially designed for working with plastics have been developed. Know-how is being broadcast at consumer level through sound instruction brochures, informative labeling, and articles in periodicals. Distribution on a "kit" basis is being worked out so that sizes and quantities of plastics do-it-yourself products may be those most generally required by the average home craftsman, so that accessory goods and even tools for a given application may accompany plastics material. Retailer education in plastics is also being developed.

Much remains to be done. Still more new materials, new tools, new methods are needed. And the more that is done to promote plastics in the do-it-yourself market, the higher will be this industry's stature in every category.

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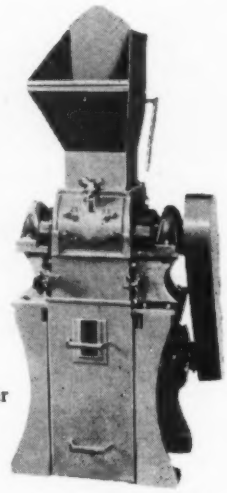
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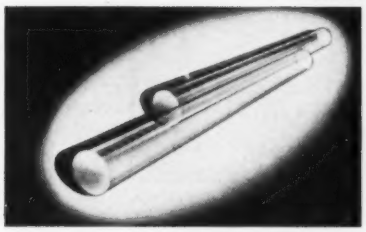
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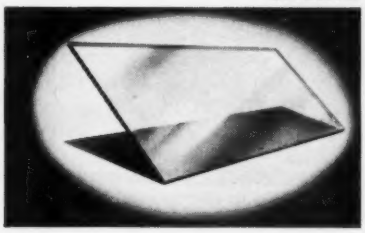
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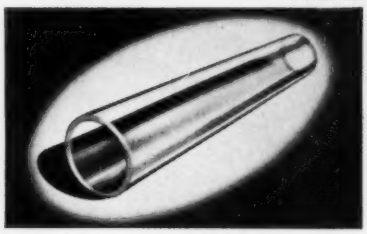
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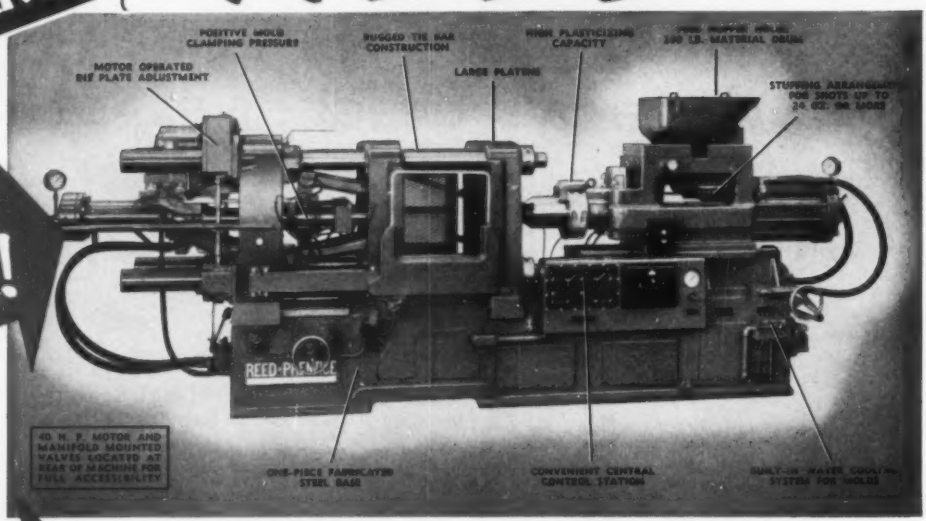
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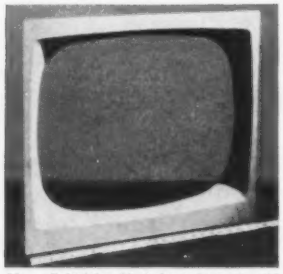
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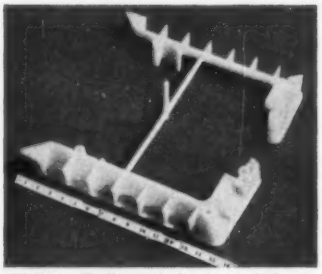
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|---|---|---|---|---|---|---|
| Mold clamping pressure, tons | 175 | 275 | 300 | 400 | 450 | 600 |
| Mold clamping stroke | 5-8" | 10¼" | 7½-12½" | 8-14" | 16" | 24" |
| Platen size (WxH) | 22x24¼" | 21x25" | 29x32½" | 38x36" | 45x40" | 54x45" |
| Diameter of tie bars | 3" | 3¼" | 4" | 4½" | 5" | 6" |
| Space between bars | 13½x13½" | 11¼x14¼" | 15x20½" | 23½"x23½" | 22½x25½" | 26½x30½" |
| Rated casting area, sq. in. | 75 | 125 | 150 | 175 | 200 | 300 |
| Plasticizing capacity, lbs. per hour | 75 | 100 | 115 | 125 | 135 | 175 |

*"Reeds" available in 4, 8, 12, 16, 20, 24, 32, 48 and 200 oz. capacity*

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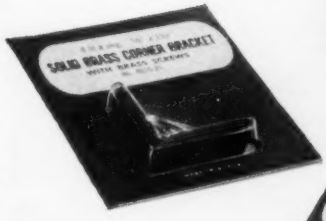
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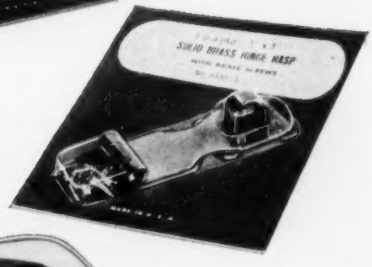
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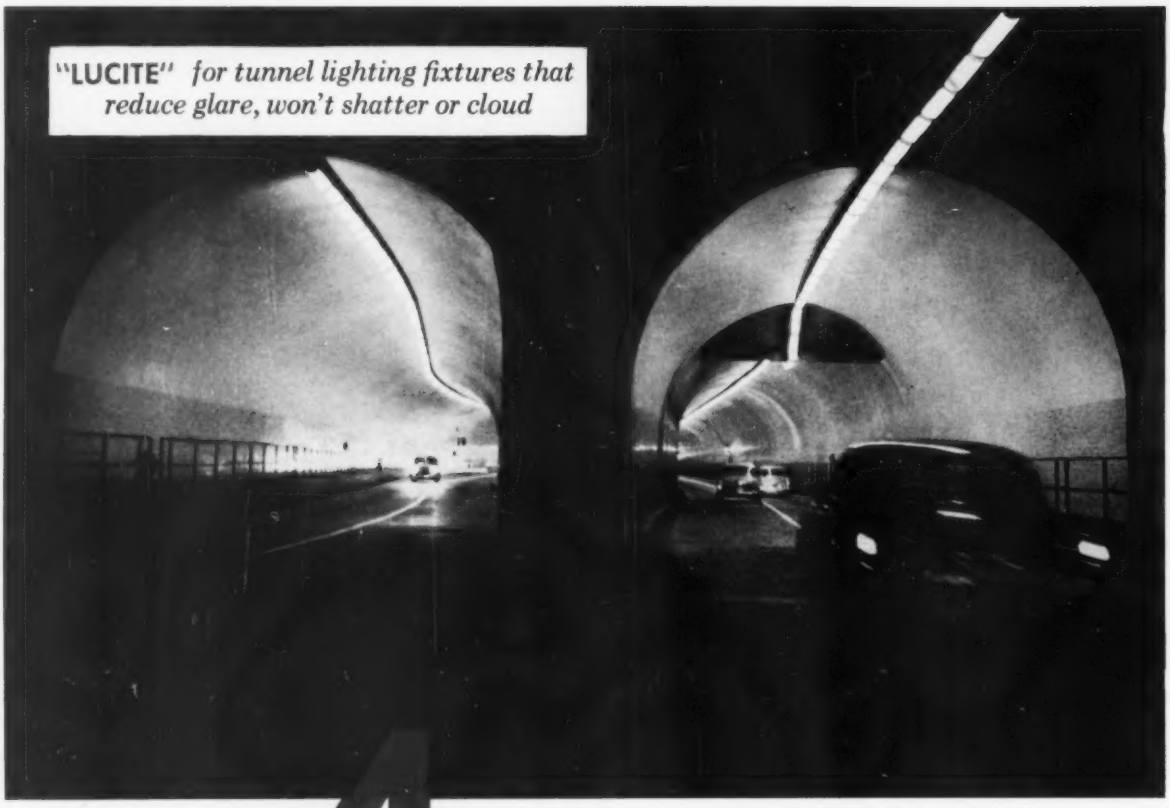
This acetate sheet—especially formulated for vacuum forming—offers fast cycle, excellent freedom from blush, and complete flexibility of detail. Vacuum-formed acetate packages permit savings up to 50% over previous methods.

This new development in packaging opens up new opportunities for flexible design at low cost. It offers new freedom in packaging hardware, jewelry, personal goods, toys and hundreds of other products.

Get in touch with the Celanese representative in your district. He can give you up-to-the-minute information. Celanese Corporation of America, Plastics Division, Dept. 101-H, 290 Ferry Street, Newark 5, N. J. Canadian affiliate: Canadian Chemical Company Ltd., Montreal and Toronto.

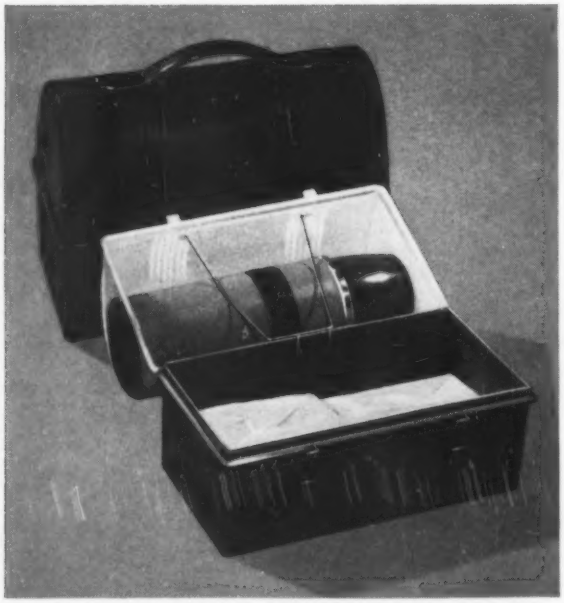
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**Celanese*** **PLASTICS**



**"LUCITE"** *for tunnel lighting fixtures that reduce glare, won't shatter or cloud*

# 4 more examples of

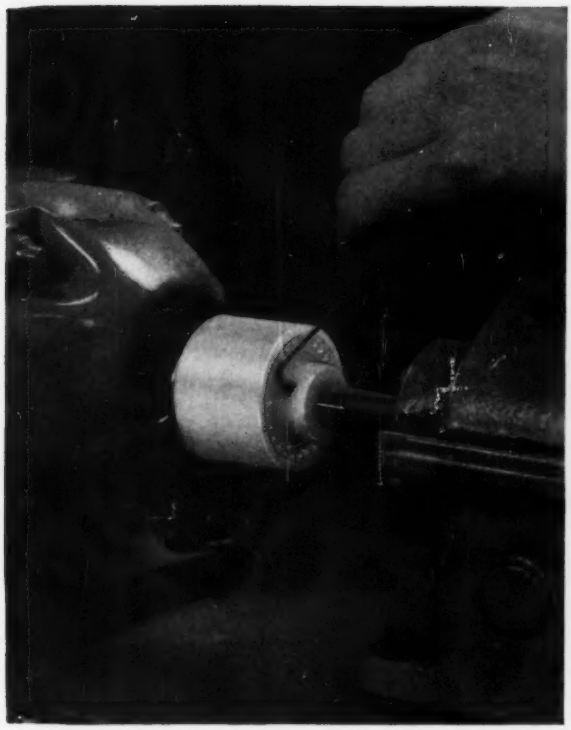


**"ALATHON"** *for a lunchbox that won't break, dent, corrode... is easy to clean*

Every day, designers and engineers are finding more new ways to improve products and processes with Du Pont's family of engineering materials: "Zytel" nylon resin, "Alathon" polyethylene resin, "Teflon" tetrafluoroethylene resin and "Lucite" acrylic resin. The result? Manufacturers are lowering their production and maintenance costs; end users have products that work better, last longer. Here are four typical cases of creative product engineering with these Du Pont materials:

**"Lucite"*** acrylic resin has played an indispensable part in the lighting system of San Francisco's new Broadway Tunnel. The fixtures of "Lucite" extend along the 1616 feet of this twin-bore installation, transmitting and diffusing the light for exceptional visibility—while eliminating dangerous glare and abrupt changes in light intensity. The fixtures are cleaned with a 100 p.s.i. water spray that tough "Lucite" withstands easily. And "Lucite" assures long service life... resists outdoor weathering and crazing... is not affected by exhaust fumes or other corrosives. (Fixtures manufactured by Sunbeam Lighting Co., Los Angeles, California.)

**"Zytel"**† nylon resin is tough and resilient—makes an exceptionally efficient gear coupling like this one which connects fractional horsepower motors to pumps and generators. The coupling of "Zytel" has three components—internally geared "sleeve" and two externally geared "hubs." It damps noise and vibration... absorbs shock loads... resists wear



**"ZYTEL"** *for tough, abrasion-resistant couplings that never need oiling*



**"TEFLON"** *for strong, flexible, chemically inert seal cages*

# advanced product engineering

without oiling (couplings operated without lubrication for 18 months showed no perceptible wear). Du Pont "Zytel" nylon resin operates continuously up to 250°F, is inert to most common chemicals, has good dielectric properties. (Manufactured by John Waldron Corp., New Brunswick, N. J.)

**"Teflon"*** tetrafluoroethylene resin gives flexibility and strength to these seal cages. They can be snapped on and off a shaft easily, won't bend or collapse under heavy gland pressure, won't score the shaft or sleeve. "Teflon" is inert to all corrosives normally found in industry... doesn't break down under temperatures ranging from −450°F to 500°F. (Manufactured by Chemical and Power Products, Inc., N. Y. C.)

**"Alathon"*** polyethylene resin is tough and lightweight – ideally suited for this smart-looking lunchbox. "Alathon" can take all sorts of hard knocks without cracking, chipping or denting. It resists the corrosives often encountered in industrial plants. "Alathon" contains no plasticizer—is tasteless, odorless and non-toxic. The entire lunchbox, including hinges, is produced economically, by injection molding. (Manufactured by Dapol Plastics, Inc., Worcester, Mass.)

* * *

Investigate the properties of the Du Pont family of engineering materials. For further information on the properties and uses of these materials, use the coupon or write to E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Room 308, Du Pont Building, Wilmington 98, Delaware.

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**BETTER THINGS FOR BETTER LIVING**

***...THROUGH CHEMISTRY***

** Registered trade-mark of E. I. du Pont de Nemours & Co. (Inc.)*
*† "Zytel" is the new trade-mark for Du Pont nylon resin.*

E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Dept., Room 308, Du Pont Building, Wilmington 98, Delaware.

Please send me more information on the Du Pont engineering materials checked: "Zytel" nylon resin □; "Alathon" polyethylene resin □; "Teflon" tetrafluoroethylene resin □; "Lucite" acrylic resin □. I am interested in evaluating these materials for_____

_____

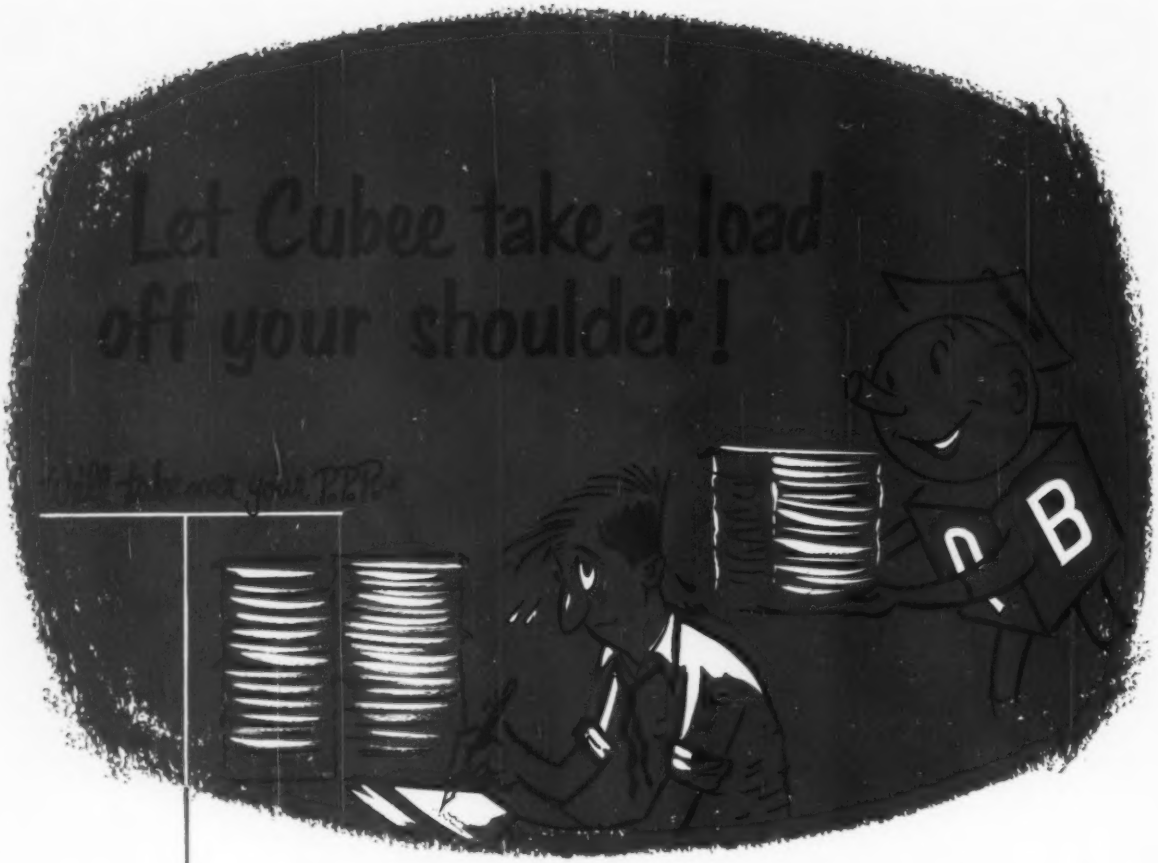
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Don't wait until your plastics parts production becomes a problem—turn that production over to Quinn-Berry now. Our facilities are complete—from design to making the mold and running the part in our modern press room. You get the benefits of our wide experience in nearly every industry—aviation, electrical, housewares, business machine, automotive and industrial.

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*Bloomfield* 2-1040

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East Rochester, New York
*Hillside* 4352

John Weiland, Jr.
7105 Grand Parkway
Milwaukee 13, Wisconsin
*Greenfield* 6-7161

Austin L. Wright
P. O. Box 561
Ardmore, Pennsylvania
*Hilltop* 7-0345



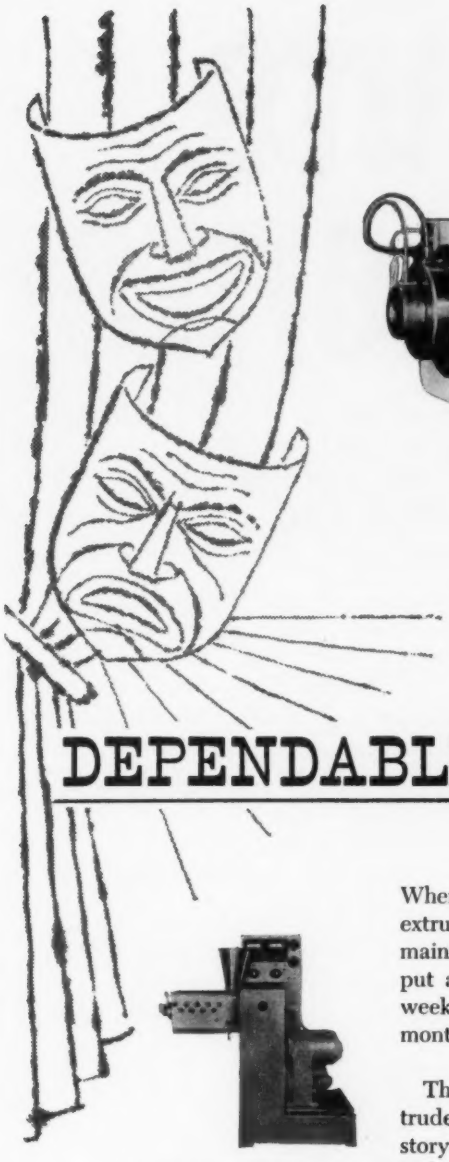


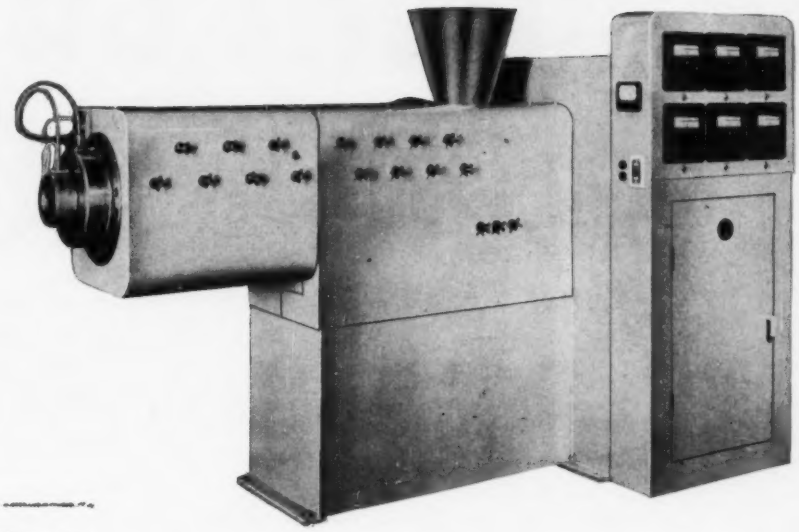
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**PLASTICS**

**MOLDERS OF ALL TYPES OF THERMOPLASTIC MATERIALS**

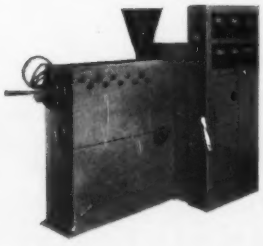




# DEPENDABLE PERFORMERS...ALL!



**Materials extruded include nylon, Kel-F, polystyrene, acetate, methacrylate, polyethylene, polyvinyl chloride and Formvar.**



**MPM extruders, in all sizes, are in daily use in more than eighteen countries, outside of the United States.**

When the "show must go on" MPM extruders can be depended upon to maintain close tolerances, high output and uninterrupted production, week after week, month after month, year after year.

The experience of countless extruders all over the world tells the story: MPM extruders are known to have the built-in endurance that insures production that is both continuous and profitable.

MPM extruders, in all sizes, have screws, strainers, cylinders, die heads, hoppers, and other vital parts which are made of corrosion resistant materials through and through.

And MPM extruders won't be outdated by the introduction of new plastic materials. Some models have as many as fifteen cooling zones . . . all have internally heated or cooled screws. Proof of their versatility can be found in the fact that nearly all material manufacturers use MPM's for laboratory development work.

Indications are that the demand for extruded products will grow for many years to come. Owners of MPM extruders and auxiliary equipment will be in the best position to meet this demand. Ask today for full data about an MPM extruder that will be your most dependable performer.

**West Coast Representative**
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15 Union St., Lodi, N. J., U. S. A.
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# SHORT CUTS TO LONG PROFITS-

## *new, post-formable sheets of* Plio-Tuf

POST-FORMING—by vacuum or mechanical drawing—offers many advantages that add up to easier, more profitable production of a wide variety of plastic products. These include: Low capital investment. Adaptability of equipment. Fast, inexpensive tooling. Short setup time. High rate of production. Thin, large-area pieces. Flexibility in design. Profitable short runs.

And all these benefits—plus more—are waiting for you in the form of wide, extruded sheets of PLIO-TUF. These rigid sheets, besides being readily post-formed, can also be drilled, punched, nailed, screwed, sawed, sewed, cemented, sanded, buffed, painted or otherwise fabricated and finished into a limitless number of products of virtually any shape or size.

Moreover, sheets of PLIO-TUF—or products formed from them—have these outstanding properties: Unmatched impact-resistance. High heat resistance. Full color possibilities. Hardness. Lightness. Stiffness. Excellent abrasion-, chemical-, electrical and age-resistance. Low cost per cubic foot.

PLIO-TUF is a new, high styrene copolymer—a virgin resin—not a blend with rubber. It need not be cured. Its excellent heat stability permits safe re-use. But most important, its high impact strength and other unusual properties permit its use where other thermoplastics cannot meet the physical requirements.

Sheets of PLIO-TUF are truly short cuts to long profits in that, through their ready post-formability, they offer you a quick, low-cost means of producing premium-quality products that command premium prices. For source of supply of PLIO-TUF sheets or literature on PLIO-TUF—granulated, colored compounds for injection molding and pure resin for individual compounding—write to:

Goodyear, Chemical Division, Akron 16, Ohio

CHEMICAL GOODYEAR DIVISION

Chemigum, Pliobond, Pliolite, Plio-Tuf, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

**Use-Proved Products—CHEMIGUM • PLIOBOND • PLIOLITE • PLIO-TUF • PLIOVIC • WING-CHEMICALS—The Finest Chemicals for Industry**



**SHAPE OF BETTER THINGS TO COME** is this wide sheet being extruded from heat- and impact-resistant PLIO-TUF. Readily post-formed, or otherwise fabricated, it offers you a short cut to long profits on premium-quality products.

*Photo courtesy General Plastics Corporation*

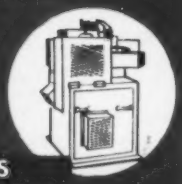
**COMPARE THESE PROPERTIES OF PLIO-TUF SHEETS (.075" GAUGE)**

| | |
|---|---|
| Tensile, psi | approx. 3000 |
| Elongation, % | 20-30 |
| Hardness, Shore "D" | 72 |
| Notched Impact, Izod, ft.-lbs./in. of notch | 9.0 @ 77°F |
| | 12.4 @ 35°F |
| | 3.7 @ 0°F |
| | 2.5 @ −20°F |
| Heat Distortion @ 66 psi | 195°F |
| Stiffness Modulus | 77°F 135,000 psi |
| | −20°F 156,000 psi |

# In Plastics Reducing Machinery, Look to CUMBERLAND for the COMPLETE LINE



GRANULATORS



DICERS



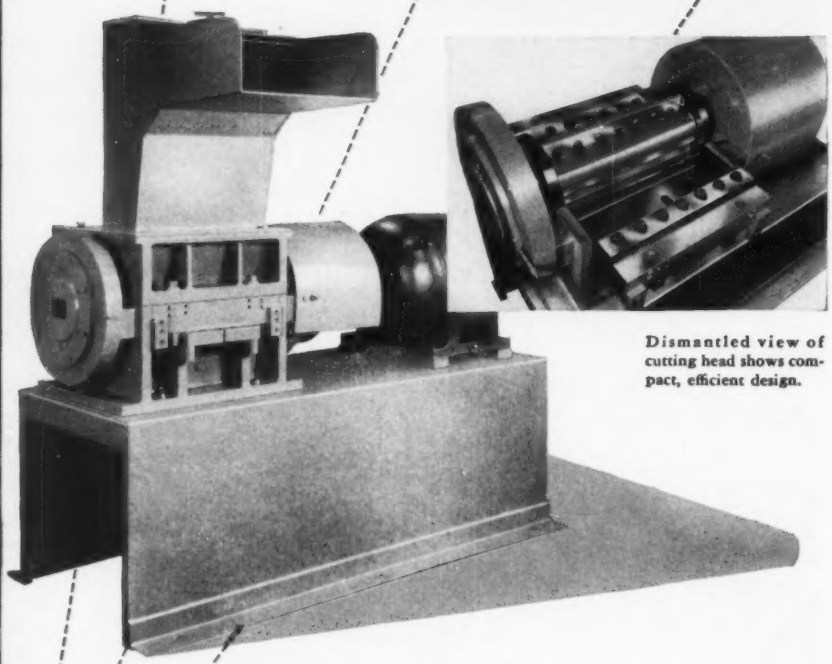
CHOPPERS



PREBREAKERS

## MODEL 20 All Steel Granulator

CUSTOM ENGINEERED
QUALITY BUILT



Dismantled view of cutting head shows compact, efficient design.

**1 HEAVY DUTY** — Large flywheel—thick all-steel weldments—deep welds—parts are of flawless wrought steel (not steel castings)—machine resists wreckage.

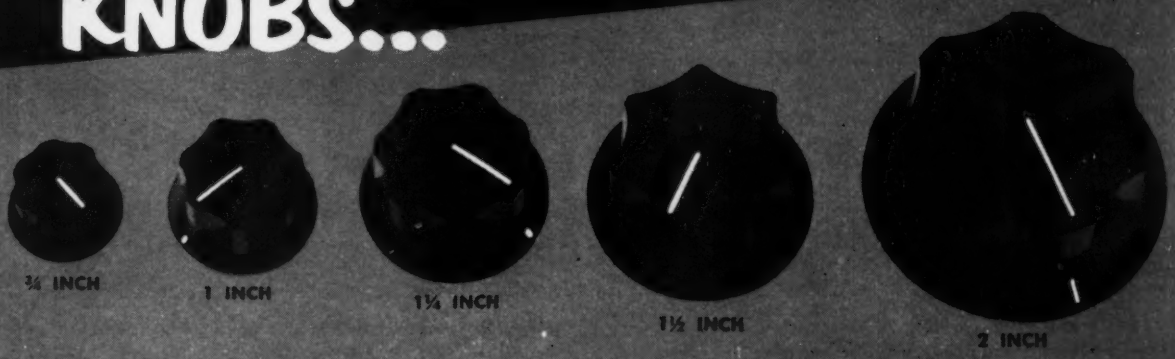
**2 LARGE THROAT OPENING** — 8 by 20" size.

**3 PRIOR BANDSAWING NOT NEEDED** — Machine specially built to handle large chunky parts such as bleeder scrap, cylinder purgings and heavy cast slabs of polystyrene, modified polystyrene and acrylic resins.

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BUILDERS OF BETTER MACHINES FOR THE PLASTICS INDUSTRY
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*Write for complete details*

# KNOBS...

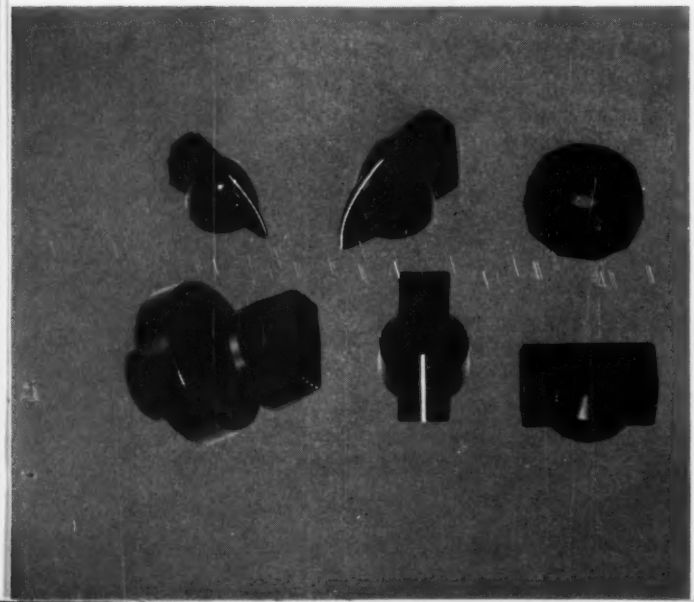



## A New All-purpose Functional Design In a Standard Line of Instrument Knobs

Now, without tooling charge of your own, you can dress up your instrument line with these beautifully designed, readily available knobs by Kurz-Kasch.

Look them over! Shown actual size, dimensions given are flange diameters. All sizes have ¼" shaft holes—come with or without brass inserts—any type of setscrew (one or more). Undersides are counterbored. Color, metalized, and filled or unfilled indicator lines at your option. Here's style at a price!

Turn to Kurz-Kasch for the most complete line of standard knobs in the industry—and SAVE. Send for samples and specification data today—or request full line data on knobs not shown. Inquiries answered at once.



*Don't overlook these popular Kurz-Kasch designs for bar knobs, pointer knobs and dual control vernier knobs.*

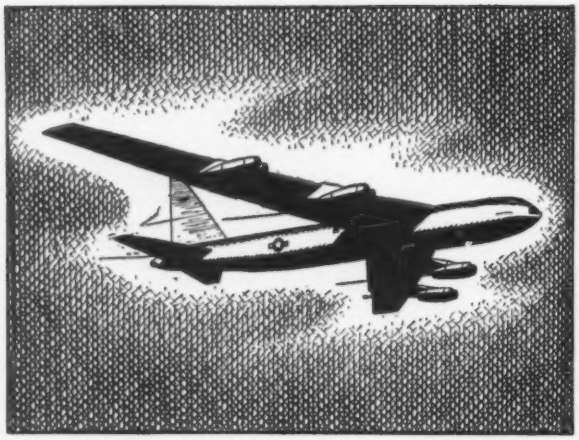
# KURZ-KASCH

**Specialists in Thermo-Setting Plastics for 37 years**

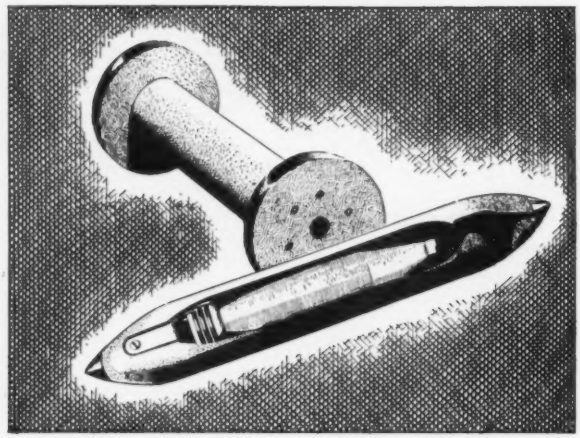
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**BRANCH SALES OFFICES:** **New York,** *Mt. Vernon MO 4-4866* • **Rochester,** *Hillside 4352* • **Chicago,** *Merrimac 7-1830* • **Detroit,** *Trinity 3-8200* • **Philadelphia,** *Hilltop 6-6472* • **Dallas,** *Logan 5234* • **Los Angeles,** *Richmond 7-5384* • **St. Louis,** *Parkview 5-9577* • **Atlanta,** *Exchange 0414* • **Toronto,** *Riverdale 3511.*

**EXPORT OFFICE: 89 Broad St., New York City, Bowling Green 9-7751.**

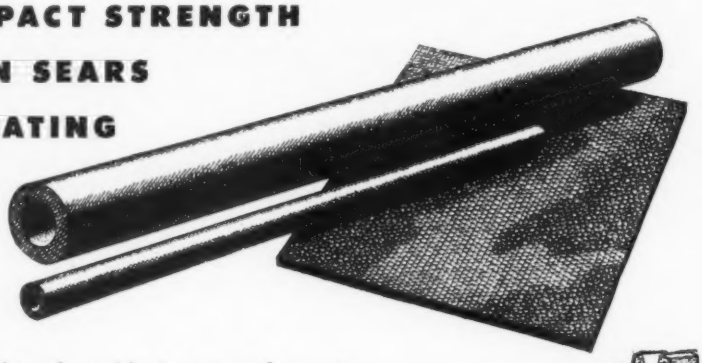


Wellington Sears filament nylon fabrics provide outstanding impact resistance to low pressure laminates, such as wing board liners for military aircraft.



Lantuck non-woven fabric is an economical reinforcement for laminates requiring superior mechanical strength, mirror-smooth surfaces and easy machineability.

# YOU GET HIGH IMPACT STRENGTH WITH WELLINGTON SEARS DUCKS FOR LAMINATING



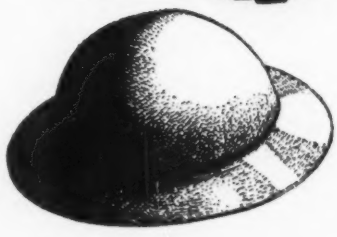
For years Wellington Sears ducks have been favored by laminators for use in reinforced plastics. These top quality fabrics provide outstandingly high impact strength.

Wellington Sears single filling duck has the right weight and rugged, hard-gripping texture to make an excellent reinforcement for C grade laminates where high impact strength is of first importance. Available in weights from about 8—15 oz. per square yard in widths of 29" and wider, it's being used in sheet stock and tubing, safety helmets, heavy-duty gears and mechanical parts of many kinds.

"Superior" army duck is another heavy, rugged fabric, ideal for shock-resistant laminates. Its plied-yarn construction insures high fiber density and freedom from sizing substances that sometimes hinder impregnation.

In addition to ducks, Wellington Sears has a complete line of drills, sheetings, and numerous special constructions available for laminators. A call or letter to our nearest sales office will bring you complete information.





**Superior Fabrics for Coating and Laminating**

- Single filling ducks
- Army ducks
- Single and plied-yarn chafers
- Special ducks
- Sateens
- Twills
- Broken twills
- Drills
- Sheetings
- Nylon, rayon, Orlon* and other synthetics
- Lantuck non-woven fabrics

*DuPont's trademark for its acrylic fiber

*Write for a free copy of "Modern Textiles for Industry" which includes pertinent information on fabric-and-plastic applications. Address: Wellington Sears Co., Dept. J-6, 65 Worth St., New York 13, N. Y.*

# Wellington Sears

A SUBSIDIARY OF WEST POINT MANUFACTURING COMPANY

***FIRST In Fabrics For Industry***

WELLINGTON SEARS COMPANY, 65 WORTH STREET, NEW YORK 13, N. Y.

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*Manufactured from*

# Erinoid

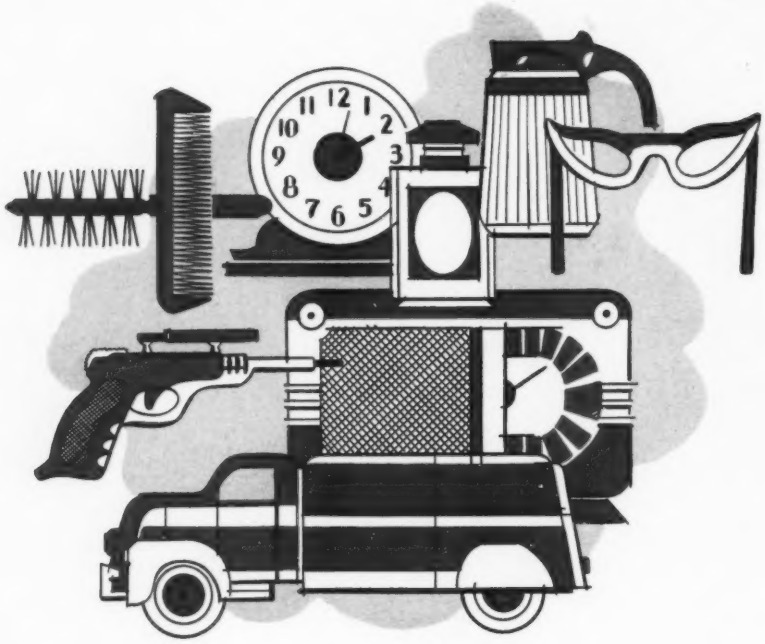
# POLYSTYRENE

Manufactured by Plastic Engineers Limited, for Industrial Appliances Limited—exclusive holders of the patented 'press-click' opening action.

The containers are used by the Kores Manufacturing Co. Ltd., as packs for their Pegasus Typewriter Ribbons.

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If you use reprocessed plastics . . . sell your plastic scrap . . . or have it reprocessed—it will pay you to do business with Muehlstein.

The superior service, high standards of quality and long experience that Muehlstein offers, assures you of constant satisfaction.

Samples and technical information are available on request.

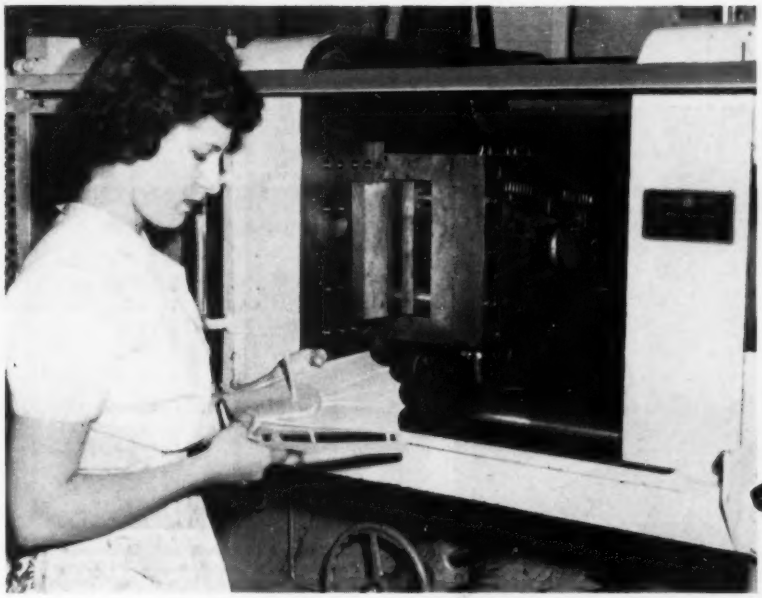
All types of virgin and scrap thermoplastics bought and sold.

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# Get into the SWIM with H-P-Ms



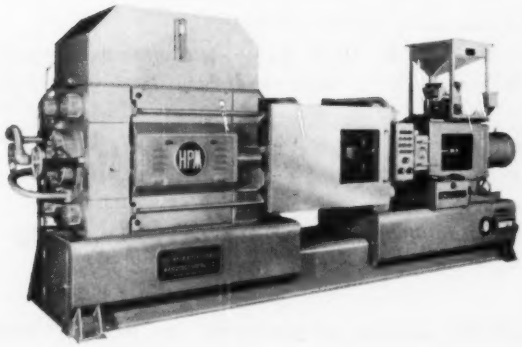


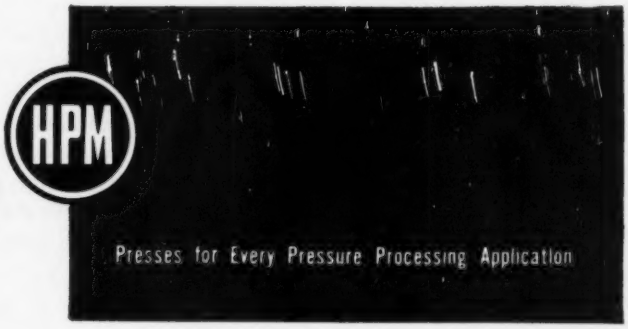
## H-P-M Injection Machines are Tops for Elastomeric Vinyls !

● H-P-M's new high-capacity plasticizing chamber, with heater bands mounted directly on the spreader, permits the injection molding of flexible vinyls at rates comparable to any other thermoplastic materials.

Two H-P-M machines at Westfall-Welsh, Omaha, are producing Sea-Bee Swim Fins and Goggles with outstanding success . . . 14 oz. heavy section "shots" on a 39 second cycle! These parts are molded at low temperatures which do not affect the chrome plating in the plasticizing chamber.

Regardless of your injection molding application . . . check what these new high-speed H-P-M machines will do for you. Write for bulletin #5406 today!

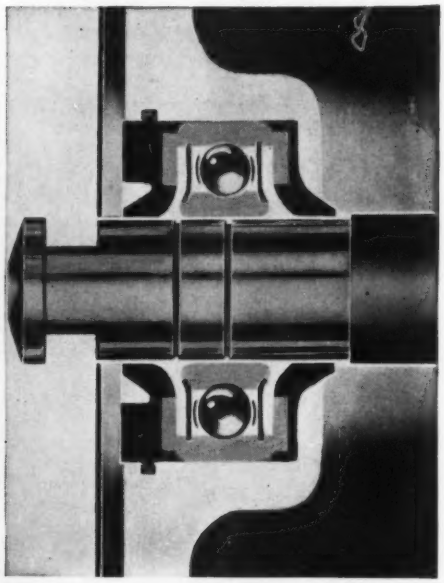


*Another new development using*

# B. F. Goodrich Chemical *raw materials*





*Bearing seals manufactured by Southeastern Rubber Products Co., Birmingham, Ala., for Transall, Inc., Birmingham, Ala. B. F. Goodrich Chemical Co. supplies the Hycar rubber only.*

## BEARING LUBE SEALED FOREVER ...*in Hycar rubber*

THE idler rolls pictured in this belt conveyor have permanently lubricated bearings that are completely enclosed by four seals made from oil resistant Hycar rubber. These seals protect the synthetic lubricant inside the bearing cavity.

Because of Hycar, the bearing seals remain tight—keeping *out* dirt and moisture, and preventing abrasive materials handled on the belts from entering the cavity to harm the precision bearings. The tight seal also keeps grease *in* and prevents leakage, the principal cause of belt deterioration—often making possible the use of belts with one less ply.

Molded to close tolerances, these tough, resilient Hycar seals resist abrasion, maintain a tight seal under all operating conditions and at temperatures ranging from —30°F. to 200°F.

These advantages of Hycar may suggest an idea to improve or develop more saleable products. We'll help you select the Hycar rubber best suited to your requirements. For technical information, please write Dept. HV-4, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

**B. F. Goodrich Chemical Company**
A Division of The B. F. Goodrich Company

**Hycar**
American Rubber

**GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON colors**

# The Peacock and the Magpie

In days of old, birds having tired of living in anarchy, decided to select a King. The overwhelming appearance and mien of the stately Peacock as he spread his rich feathers resulted in his almost unanimous acclimation for the coveted post.

The only dissenter, a Magpie, stepped forth from the assembly and spoke thusly: "Sir Peacock, you look like a King and bear yourself like a King—but how do you propose to protect us from the ravenous Eagle, Vulture and Kite?"

The Peacock, taken aback at this bold question, merely continued to strut his finery and kept silent. This drew the other birds into deep reflection and they then resolved to make a new selection.—**Aesop**

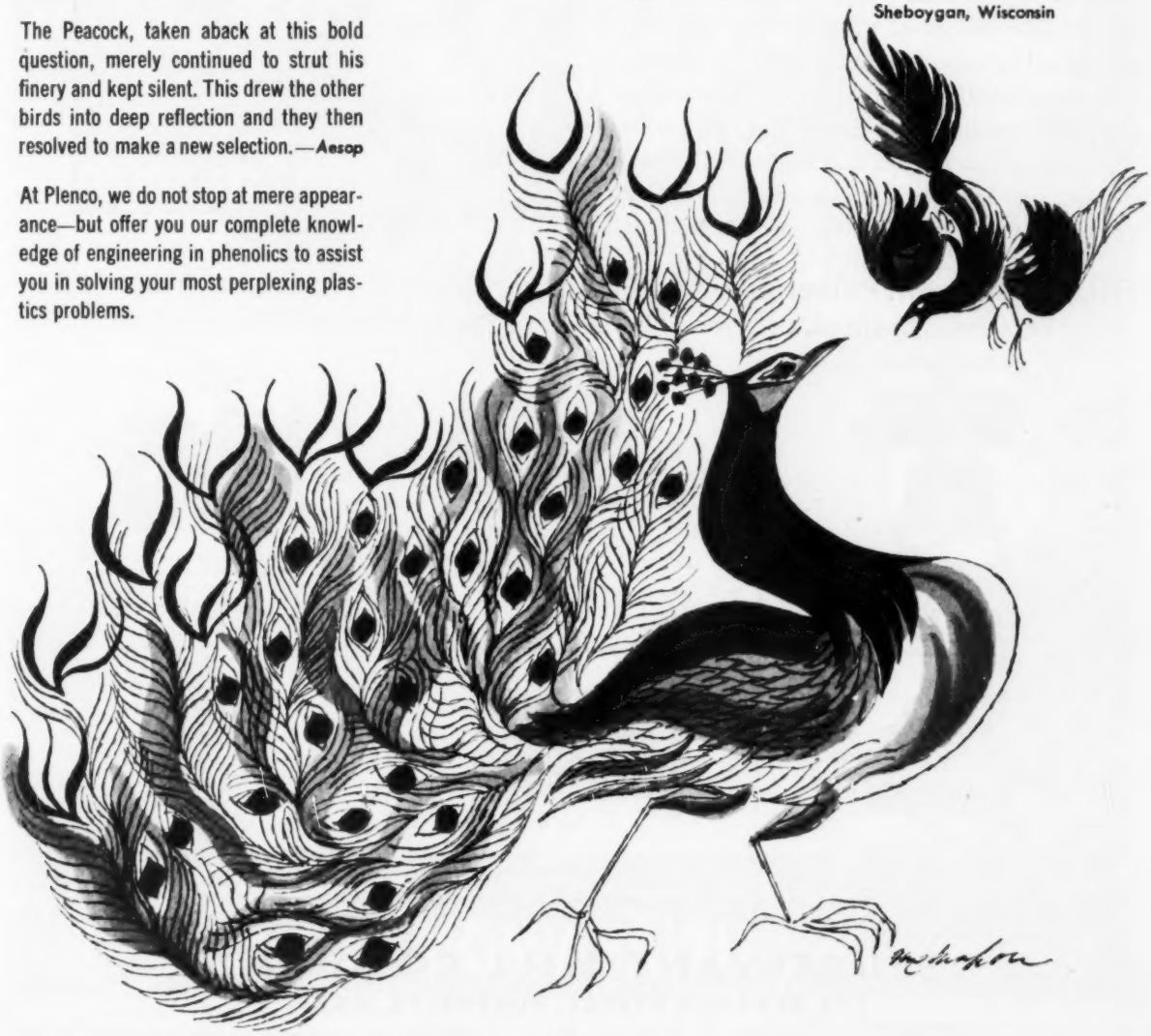
At Plenco, we do not stop at mere appearance—but offer you our complete knowledge of engineering in phenolics to assist you in solving your most perplexing plastics problems.

PLENCO PHENOLICS

*FOR BETTER PLASTIC PRODUCTS*

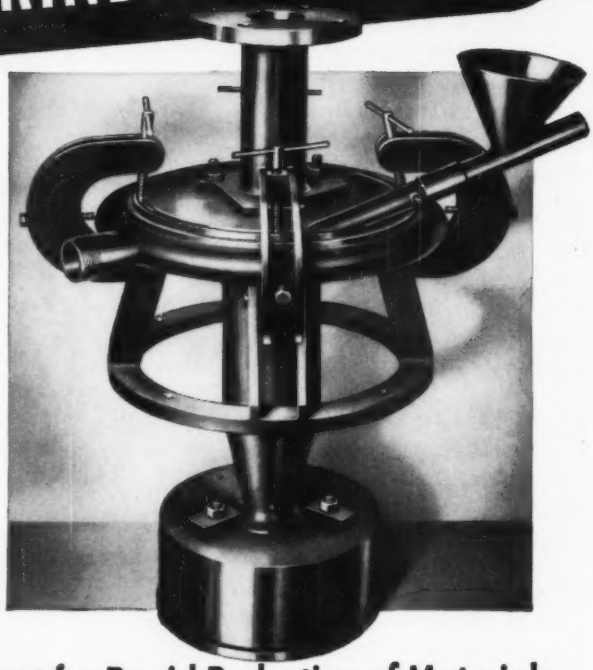
**PLASTICS ENGINEERING COMPANY**

Sheboygan, Wisconsin



# Sturtevant

# MICRONIZER* GRINDING MACHINE



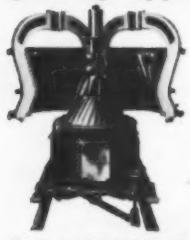
## Reduces Solids to Micron Sizes

The new Sturtevant *Micronizer* grinding machine is a fluid jet grinder especially designed to reduce solid materials to particle sizes in the micron ranges.

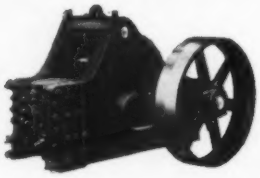
Sturtevant *Micronizers* are used for simultaneous dry grinding and classification of solids. The variety of materials that can be processed is large and includes both metallic and non-metallic minerals and ores, metals, pigments, insecticides, fungicides, pharmaceuticals, plastics, dyes and numerous other organic and inorganic products. Available in capacities from ½ to 3000 pounds per hour.

## Other Sturtevant Pulverizing Equipment for Rapid Reduction of Materials...

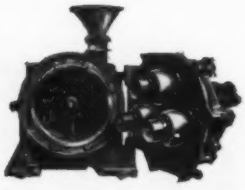
***Especially Applicable for Initial Grinding of Products for the Micronizer Mill***



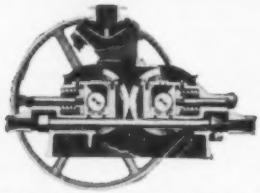
*ROTARY FINE CRUSHERS* for intermediate and fine reduction (down to ¼"). Open door accessibility. Soft or moderately hard materials. Efficient granulators. Excellent preliminary Crushers preceding Pulverizers.



*JAW CRUSHERS* for coarse, intermediate and fine reduction of hard or soft substances. Heavy or light duty. Cam and Roller action. Special crushers for Ferro-alloys. Several types, many sizes.



*RING-ROLL MILLS* for medium and fine reduction (10 to 200 mesh), hard or soft materials. Very durable, small power. Operated in closed circuit with Screen or Air Separator. Open door accessibility. Many sizes. No scrapers, plows, pushers, or shields.



*CRUSHING ROLLS* for granulation, coarse or fine, hard or soft materials. Automatic adjustments. Crushing shocks balanced. For dry or wet reduction. Sizes 8 x 5 to 38 x 20. The standard for abrasives.



*SWING-SLEDGE MILLS* for coarse and medium reduction (down to 20 mesh). Open door accessibility. Soft, moderately hard, tough or fibrous substances. Built in several types and many sizes.



*AIR SEPARATOR* for separation of fines to 325 mesh and finer. Increases output from 25% to 300%... lowers power costs by 50%. Capacities ¼ to 50 tons per hour output.

*Registered trademark of the Sturtevant Mill Company

## STURTEVANT MILL COMPANY

**110 CLAYTON STREET, BOSTON 22, MASS.**

DESIGNERS & MANUFACTURERS OF DENS AND EXCAVATORS • MIXERS • SCREENS • PULVERIZERS • ELEVATORS • AND COMPLETE FERTILIZER UNITS




Leominster, Fitchburg, Providence, New York
Chicago, Puerto Rico, Canada, England

102 Adams Street
Leominster, Mass., U. S. A.

Egan

# extruder



Remote Control Panel

Internal wiring for extruder and control panel complete to coded terminals for quick installation at any location.

**FOUR SEPARATE MAIN COMPONENTS**

● "Tailored" Screw ● Independent Thrust Bearing Housing

● Individual Feed Section ● Heavy Wall Cylinder

**ALL WITH IMPROVED FEATURES**

for increased production, reduced maintenance and complete flexibilty. Designed to meet *ANY* requirements. Can be supplied complete with dies and take-off equipment.



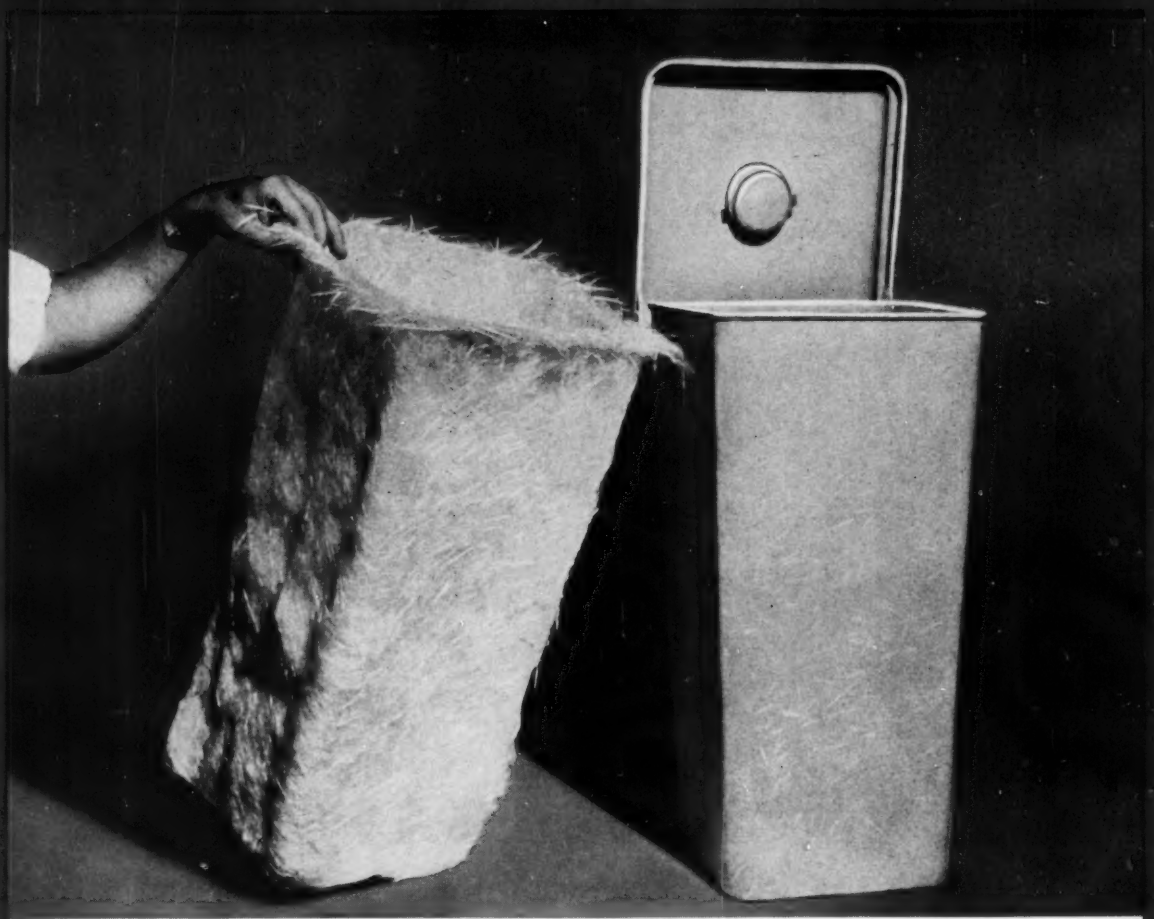

Write for details or invite our representative to call

**FRANK W. EGAN & COMPANY**

Designers and Builders of Machinery
for the Paper Converting and Plastics Industries

Bound Brook, New Jersey

Cable Address "EGANCO"—BOUNDBROOK, N.J.



# WHY HOLIDAY PLASTICS USES **PARAPLEX** MOLDING RESINS

This diaper hamper, molded in one piece except for the lid, is one of a whole range of durable, attractive items produced by Holiday Plastics with the aid of Rohm & Haas PARAPLEX "P" resins. Holiday Plastics also chose PARAPLEX resins for such products as heat-resistant lamp shades; smooth, one-piece trowels; and rugged camera cases. PARAPLEX was preferred because:

**PARAPLEX "P" resins are available in a number of grades, each compatible with all the others. They can be blended to obtain special properties. The resins can be infinitely diluted with monomeric styrene and other monomers.**

**PARAPLEX "P" resins are 100-percent reactive. They can be converted into solid, infusible products which are soft and flexible, or rigid and tough.**

**PARAPLEX "P" resins can be cured at either room or elevated temperatures. By proper catalyst selection, they can be adapted to a variety of production schedules. The resins are highly stable, both when catalyzed and uncatalyzed.**

*PARAPLEX is a trade-mark Reg. U.S. Pat. Off. and in principal foreign countries.*

By making their diaper hamper of PARAPLEX resins and glass fibers, Holiday Plastics gave it light weight, high strength, and long life. The hamper won't dent. Colors won't come off even under the frequent steam-sterilization to which these hampers are subjected, because the colors go through and through. Cleaning is easy. The resins are unaffected by soap and water, common solvents, and many corrosive liquids.

Sound interesting? Then write us today and let us tell you more about the PARAPLEX resins.

CHEMICALS FOR INDUSTRY

**ROHM & HAAS COMPANY**

**THE RESINOUS PRODUCTS DIVISION**

Washington Square, Philadelphia 5, Pa.

*Representatives in principal foreign countries*




*Over 8 pounds of polyethylene are used in molding this 36-in. diameter water meter propeller for the Sparling Main-Line Meter, made by Sparling Meter Company.*

# METASAP® STEARATES

## *deliver easier mold release*

For molding those intricate shapes, for deep drawing, or for larger-than-average pieces, the tested way to easy ejection is to use the right Metasap Stearate in your molding compound.

There are two ways to use these Stearates. You can incorporate Metasap Zinc or Calcium Stearates into the molding compound itself, or simply dust them on the molding surface. Either way, you get improved lubrication at lower ejection pressures. You step up your output, get fewer rejects, and better finished products. Your molds last longer too.

Metasap Technical Service is prepared to help you find the materials and mixing procedures best fitted to your production methods.

And to produce economical plastigels . . . Metasap offers a complete line of quality stearates, effective as thickening agents. Free testing samples of Magnesium, Barium, Calcium, or Aluminum Stearates are yours on request.

**METASAP CHEMICAL COMPANY**
**Harrison, N. J.**

REG. U. S. PAT. OFF.
METASAP CHEMICAL COMPANY

Chicago, Ill. • Boston, Mass.
Cedartown, Ga. • Richmond, Calif.

# METASAP STEARATES

*the cleanest stearates made*

# Plastic and other Non-Metallic Parts

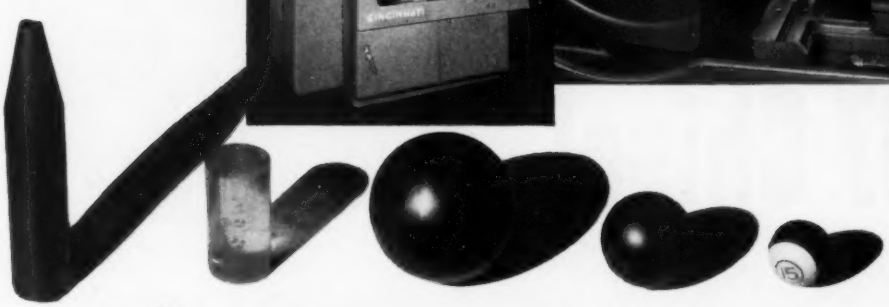
## Finished to size at negligible cost on CINCINNATI FILMATIC CENTERLESS GRINDERS

Adding a grinding operation to your cylindrical and spherical plastic products need not price them out of the market. CINCINNATI FILMATIC Centerless Grinders have the potential to grind parts of this type at an extremely high rate of production and at negligible cost. Fountain pen parts, for example, are centerless ground on a CINCINNATI at a production rate of 1200 per hour. ¶ Investigate the CINCINNATI centerless method of improving accuracy and quality of finish on plastic parts. Brief description of the CINCINNATI FILMATIC line of Centerless Grinders will be found in Sweet's Machine Tool Catalog; complete data may be obtained by writing for literature. For the No. 2 size machine, ask for catalog No. G-611-1.

**CINCINNATI GRINDERS INCORPORATED**
*Subsidiary of The Cincinnati Milling Machine Co.*
**CINCINNATI 9, OHIO**



CINCINNATI FILMATIC No. 2 Centerless Grinding Machine. Catalog No. G-611-1.



Pool and billiard balls of several sizes from 1¼" to 2" diameter are accurately ground to a high-quality finish on this CINCINNATI FILMATIC No. 2 Centerless Grinder.

FILMATIC

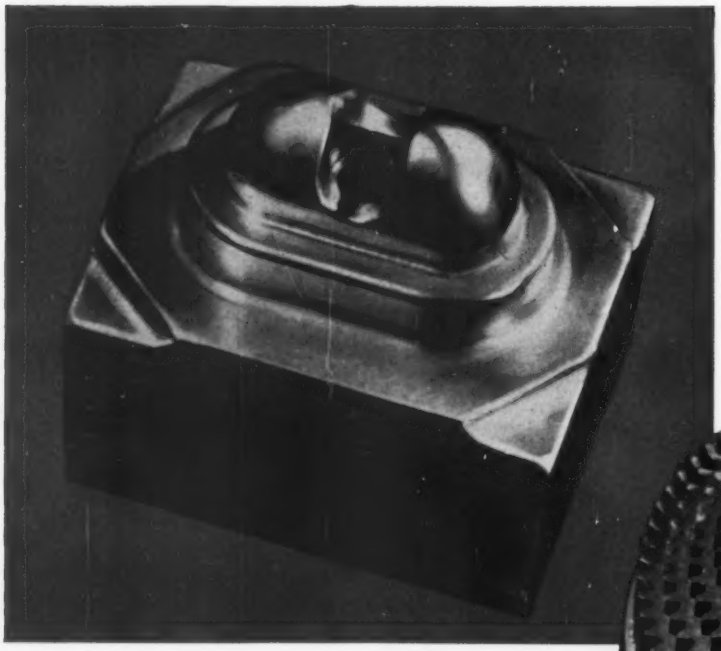


Variety of plastic and other non-metallic parts ground at low cost on CINCINNATI FILMATIC Centerless Grinders.

CINCINNATI

# CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES



These representative master hobs were made of 67 Chisel because of its high strength and resistance to shock. The hob at left is used in the manufacture of a door catch, made of plastic; the other hob is used in die-casting a multiple gear.



# Want Fine Master Hobs Every Time?

# Use 67 Chisel

If you are making master hobs, your first requirement is a steel with such properties as high compressive and tensile strength, and maximum resistance to wear. But what about minimum deformation in hardening? . . . Minimum scaling in heat-treatment? . . . Good machinability? . . . They're important, too.

Bethlehem 67 Chisel is an outstanding steel for master hobs because it ranks high on all these points. It's a tough, shock-resisting chrome-tungsten type of steel. Even on sharp corners and fine edges, 67 Chisel does not spall. It has fine abrasion-resistance, even under the most severe applications.

*Typical Analysis*

| | |
|---|---|
| Carbon 0.50 | Chromium 1.15 |
| Silicon 0.75 | Tungsten 2.50 |
| | Vanadium 0.20 |

67 Chisel is an economical steel because it is so easy to machine and heat-treat. If you would like full details about the special carburizing treatment which is so essential for master hobs, write to the nearest Bethlehem office for Booklet 349. And for a trial order of 67 Chisel, get in touch with your distributor.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

## BETHLEHEM TOOL STEELS

BETHLEHEM STEEL

# hercocel®

## FOR PRODUCTS ON THE MOVE




Designed with Hercocel, these plastic barrettes are truly hair jewelry of exquisite beauty and outstanding quality.

"Hercocel particularly adapts itself to our intricate methods of decoration," says Mr. Claude Gresham, Vice President of Tip-Top Products Company, who like many other executives today has found Hercocel ideally suited for the manufacture of quality multicolor decorations by mass production methods.

Molded from Hercocel into thin-walled sections that will not snap when bent, they have the necessary flexibility and resilience. And Hercocel's ability to take lacquer better than other plastics contributes to the beauty of the seven seasonable colors in which the barrettes have been designed to complement every outfit a little girl wears.

For information on how Hercules is helping the plastics industry keep its products on the move, write:

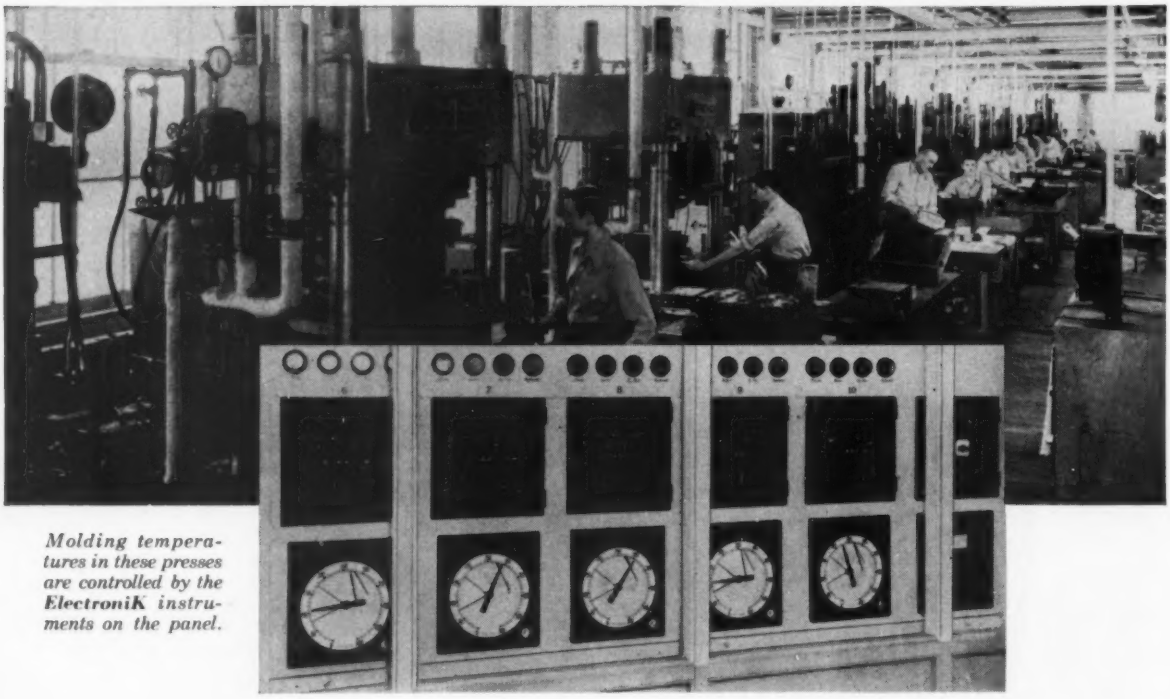


Match-Mates Barrettes Cards retail at 59¢
Plastic Handbag with Barrettes retails at 98¢
by TIP-TOP Products Company, Omaha, Nebraska

Cellulose Products Department
*HERCULES POWDER COMPANY*
INCORPORATED
916 Market Street, Wilmington 99, Del.

CP54-4

# Reject rate slashed– *through ElectroniK control* of molding temperature



*Molding temperatures in these presses are controlled by the ElectroniK instruments on the panel.*

BY SWITCHING from conventional time-cycle regulation to precise *ElectroniK* control of die temperatures, The National Cash Register Co. has given their molding machines a sizable boost in productivity.

Key tips for National equipment, molded of cellulose acetate butyrate in 21 different colors, now come out of the dies with such excellent uniformity of lamination that the reject rate has dropped nearly to zero. Machine stoppages to determine causes of excessive rejects have been materially reduced. The *ElectroniK* charts save trouble-shooting time, by pointing out trends in machine operation. And these charts give management a ready index to machine productivity, because they show clearly every press cycle for the day's work.

A pencil type thermocouple inserted in the upper die of each press detects temperature right next to the die cavities. Connected to the couple is an *ElectroniK* instrument which records die temperature and through its pneumatic control system, regulates steam to the dies to hold constant temperature throughout the preheat cycle. The instrument automatically energizes a cycle timer when the specified molding temperature is reached. Precise, fully automatic control is thus maintained over both the cycle time and molding temperature.

A wide variety of Brown instruments are supplied for the requirements of different types of molding machines. Whatever your control problem, your nearby Honeywell sales engineer can give you valuable assistance . . . and he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

● **REFERENCE DATA: Write for Catalog 1531, "*ElectroniK* Controllers."**

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

*First in Controls*

More service from Monsanto . . .

# Two NEW Low-Temperature PLASTICIZERS For VINYLS . . .

**1.**

**DI (2-ETHYLHEXYL) ADIPATE (DOA)**

**ADVANTAGES:** readily available for the first time from a basic producer. Monsanto makes its own adipic acid. DOA imparts excellent low-temperature flexibility. Extremely useful for controlling the viscosity of plastisols.

**USES:** Ideal for use with vinyl products such as garden hose, film and coated fabrics. Also effective in plastisols for toys, footwear, sponge, and other products.

**2.**

**DI-N-OCTYL, N-DECYL PHTHALATE (DNODP)**

**ADVANTAGES:** most economical quality plasticizer for imparting good low-temperature flexibility, low volatility, good heat and light stability, and water resistance. Imparts excellent plastisol characteristics.

**USES:** One of the best plasticizers now on the market for film and sheeting, coated fabrics, and garden hose. It will enable users to economically upgrade their vinyl products, obtaining products with good flexibility and resistance to soapy and boiling water.

MONSANTO
CHEMICALS – PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

FOR MORE INFORMATION write Organic Chemicals Division, MONSANTO CHEMICAL COMPANY, Box 478, St. Louis 1, Missouri.



# *Mechanical Sculptor* CARVES BIG MOLDS

With feather-light touch, the tracer of this huge die sinking machine passes over the surface of a master pattern. The slightest change in contour is transmitted by a varying electric current to the cutter, which faithfully reproduces every intricate detail of the pattern in the mold cavity.

From the mold shown, Bridgeport Moulded Products Co., Inc. produced the handsome grille of the Philco air conditioner pictured in the inset—one of the hundreds of fine products for which molds have been created by the skilled hands and modern facilities at Newark Die Company.

Big molds have been a big factor in the growth of the plastics industry. For more than 30 years Newark Die has led in the design and construction of all types of molds.

Write for free booklet "SOLVING BIG MOLD PROBLEMS"

**NEWARK DIE COMPANY**

22 SCOTT STREET, NEWARK 2, N. J.

Phone: MArket 2-3305

NDC TRADE MARK




# How to Lower Vinyl Compounding Costs

Chlorowax* 40 and Surfex* MM can be used separately or in combination to lower vinyl compounding costs and increase batch yields with no sacrifice in quality. Chlorowax 40 is DIAMOND ALKALI's liquid chlorinated paraffin which has gained wide acceptance as a low-cost co-plasticizer. Surfex MM is one of DIAMOND's precipitated calcium carbonates—a filler of high uniformity and purity.

The table below shows how these DIAMOND Chemical products can be used to produce two-way savings. Your nearby DIAMOND Sales Office can show you other moneysaving formulas and supply detailed cost comparisons, or write DIAMOND ALKALI CO., 300 Union Commerce Building, Cleveland 14, Ohio. **

**DIAMOND SALES OFFICES:**
New York, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, St. Louis, Memphis, Houston.

**DIAMOND DISTRIBUTORS:**
C. L. Duncan Co., San Francisco and Los Angeles; Van Waters and Rogers, Inc., Seattle and Portland, U.S.A.; Harrisons & Crosfield (Canada) Ltd.

**TRY THIS RECIPE FOR LOWER COST VINYL COMPOUNDS**

| | Parts |
|---|---|
| PVC Resin | 100 |
| Primary Plasticizer | 50 |
| Chlorowax 40 | 10 |
| Stabilizer | 3 |
| Stabilizer-Lubricant | 0.5 |
| Surfex MM | 20 |
| | 183.5 |
| Hardness | 85A |
| Tensile Strength | 2600 psi |
| Elongation | 375% |
| 100% Modulus | 1400 psi |
| Crescent Tear | 375 lbs./in. |
| Brittleness-Temperature | -29°C |
| Heat Loss | 4.7% |

DIAMOND ALKALI CHEMICALS ®

**DIAMOND ALKALI COMPANY**
**CLEVELAND 14, OHIO**



# Why stop AUTOMATION at Assembly?

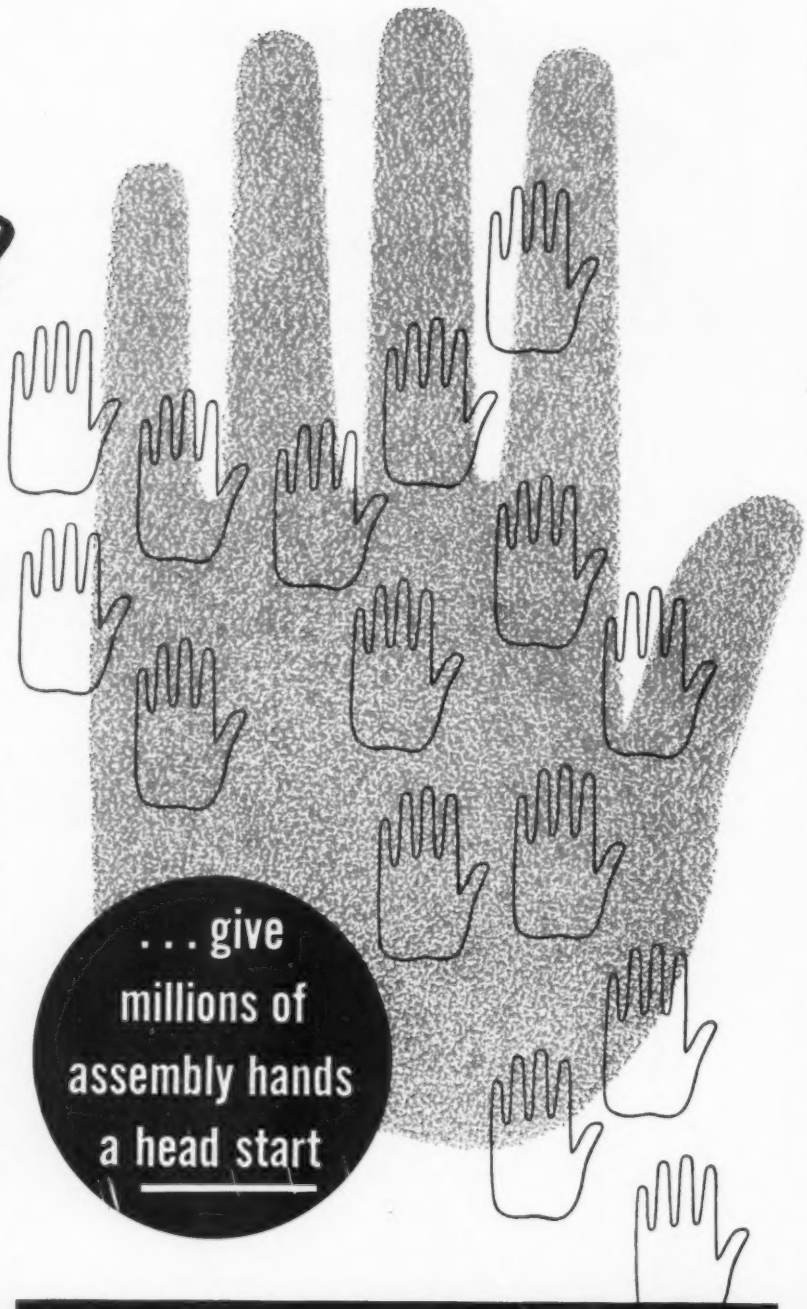
Automation is a new name for an objective long pursued by industry's keenest minds. It means successive elimination of manual operations.

In the production of metal or plastic component parts — by machining, molding, etc. — automation has made advances that in some cases seem almost magical.

By contrast, *assembly* often plods along slowed by outdated methods.

Progress toward automation *does not* end where assembly begins for manufacturers who take full advantage of the P-K Fastening Method. They *eliminate* manual operations like tapping, nut-running, inserts in plastic — and avoid the attendant trouble and expense. Automatic screw driving equipment can be used to further mechanize hand operations on many applications. Savings run up to 50% and more.

*Complete* automation is, for most, a *distant* dream. Meanwhile, assembly *hands* control your fastening costs. Find out how P-K Self-tapping Screws can *double — even triple* — their efficiency. It *pays* — and pays well — *today*. Talk to a P-K Assembly Engineer. Parker-Kalon Division, General American Transportation Corporation, 200 Varick St., New York 14.

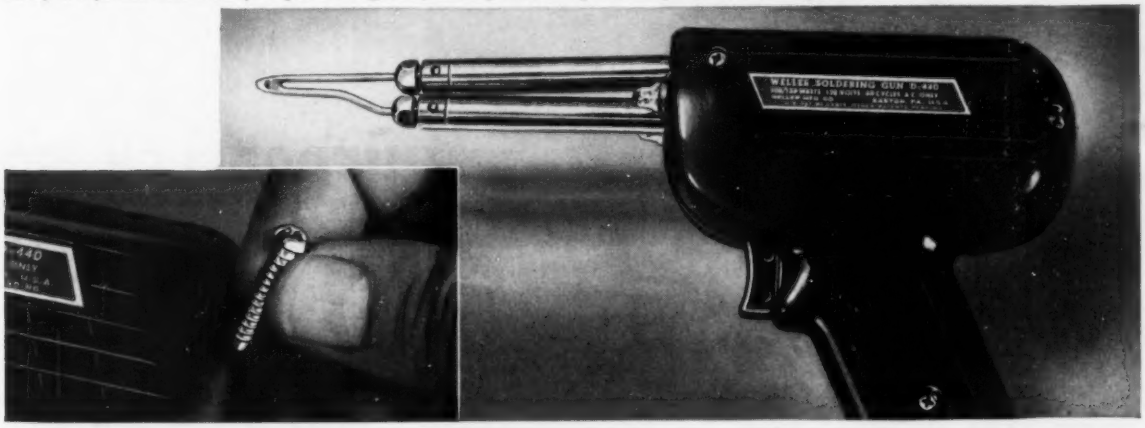



**PARKER-KALON**®

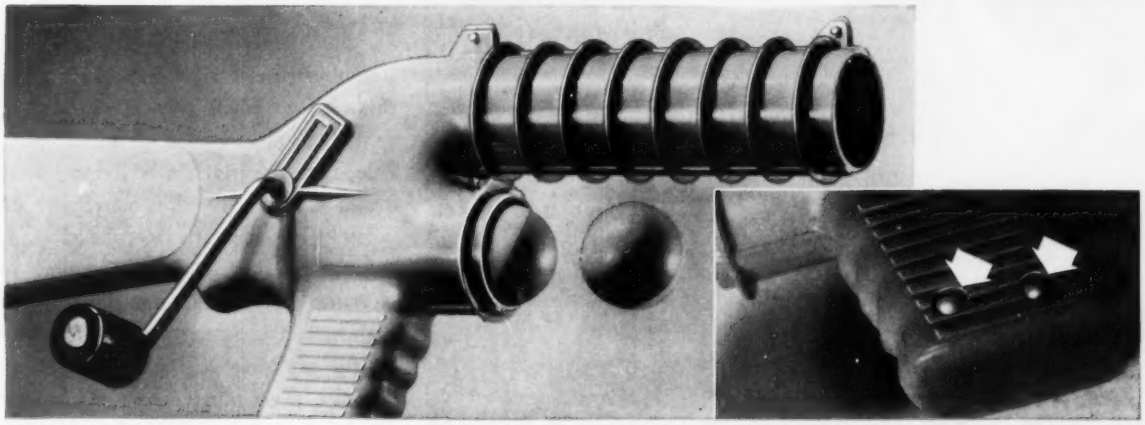



**IN STOCK** . . . see your nearby P-K Distributor . . .

**WELLER FINDS IT PAYS** to follow its own advice. In selling its efficient Soldering Gun, Weller Mfg. Co. urges a look at assembly costs. A "turnabout" look at assembly of the Solder Gun revealed costly delays due to difficulty in positioning nuts, in deep recesses, to receive machine screws. Weller ended delays, also trouble with loosening and lost nuts, by switching to P-K Self-tapping Screws. Three Phillips Head Type F-Z's fasten two halves of phenolic plastic handle together.




## with P-K quality—planned assembly savings pay off



**THE AIM'S THE SAME FOR KUZAN** In toy guns, too, the aim is elimination of needless assembly operations. Kuzan, Inc., needed the simplest, strongest fastening method that would also foil Junior's urge to take apart the Kazooka (it shoots ping pong balls). That proved to be 5 P-K Type U Drive Screws, easily and permanently pressed in to join the two halves of the Styron plastic case.

*The Original*

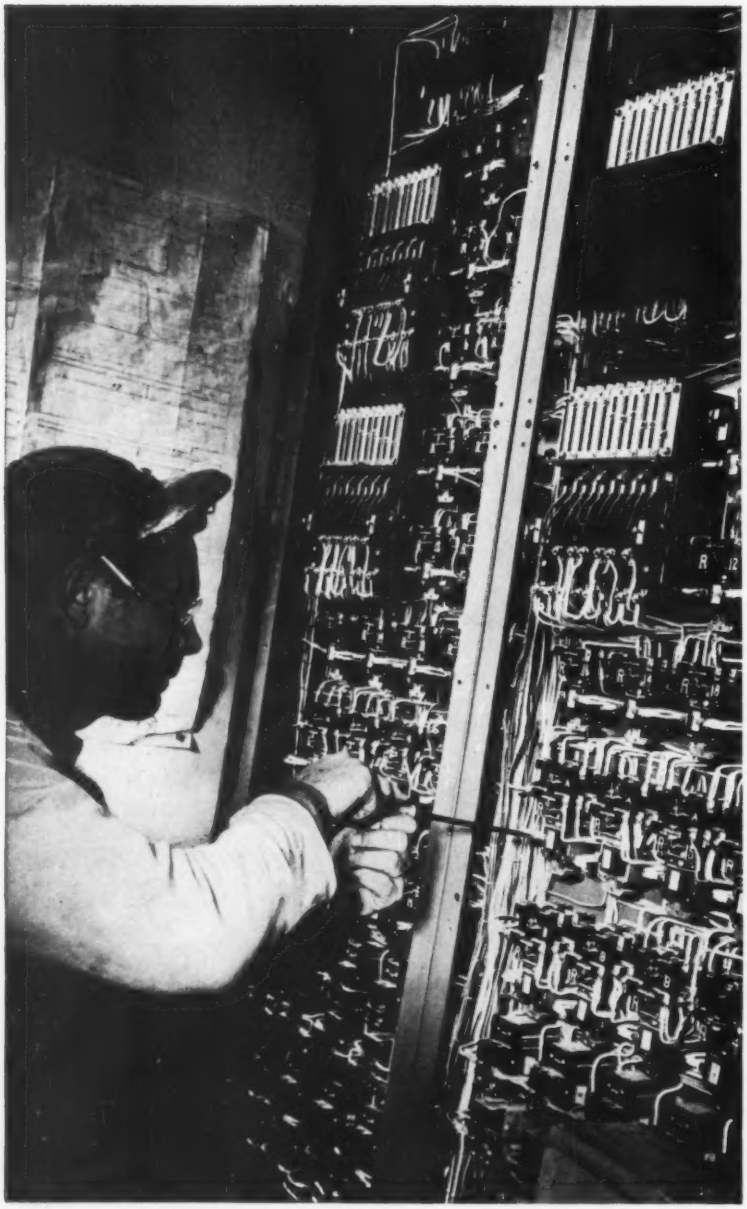
# SELF-TAPPING SCREWS







**your local Supply and Service Specialist**



# HERCOFLEX 150 IS MADE FOR LIVE WIRES

Complicated electrical installations, like this "switch board" which operates the centrifuge at Hercules' plant in Mansfield, Massachusetts, give longer, more dependable service when vinyl wire insulation is made with Hercoflex 150.

Hercoflex 150, one of a number of Hercules vinyl plasticizers, retains its high dielectric strength even after prolonged exposure to high temperature. And the broad range of useful temperatures observed in vinyls plasticized with Hercoflex 150 is making it increasingly popular not only for extruded wire coatings but also for cable-jacket stock.

Compatible with most primary and secondary vinyl modifiers, Hercoflex 150 can be processed quickly and economically with the various vinyl chloride polymers and copolymers. It has unusually low volatility and is always uniform in quality, properties, and performance.

Hercoflex 150 is readily available. For additional technical data, write Hercules.

**HERCOFLEX®** VINYL PLASTICIZERS
- **150** (di-N-octyl, decyl phthalate)
- **200** (di-iso-octyl phthalate)
- **290** (di-N-octyl, decyl adipate)

*Synthetics Department*

*HERCULES POWDER COMPANY*
INCORPORATED

*916 Market Street, Wilmington 99, Delaware*

SH54-2

# Every Day More Plastics Manufacturers *Standardize on*

# NRM Extruders



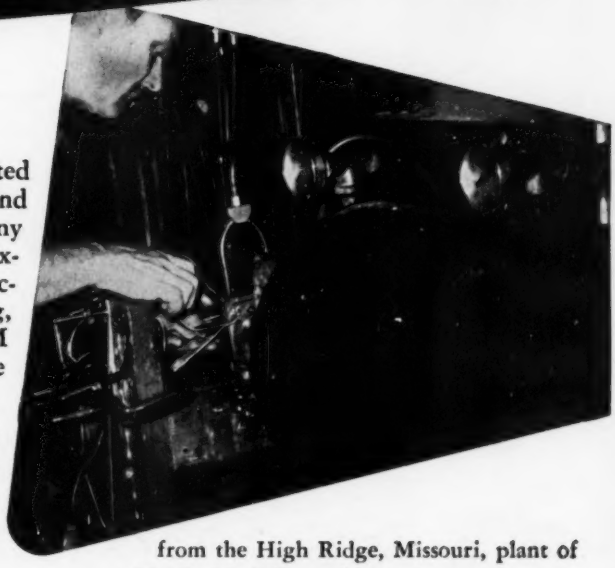
NRM
MODEL 50
2½"
ELECTRICALLY HEATED
THERMOPLASTICS
EXTRUDER

## HERE'S WHY...

If you are *not* an NRM owner, you'll be interested in the *reasons* behind the higher performance and lower maintenance costs which cause so many plastic processors to standardize on NRM Extruders. Finest materials and precision construction are *basic,* of course, and assure the long, trouble-free operating life which has made NRM extruders famous in large and small plants the world over.

Then there's design. Balanced heat control, the quick-opening die gate and corrosion-resistant "cyliner" construction — all NRM "firsts" — work together to obtain the higher output of top quality extrusions which makes NRM Extruders the most *profitable* machines to operate.

At no obligation we'll send you *full* details on the NRM line . . . the only *complete* line of thermoplastic extruders and equipment. Write us *today.* Compare the advantages of NRM Extruders with any other make, and you, too, will standardize on NRM Extruders.



from the High Ridge, Missouri, plant of

**K-S-H Plastics, Inc.**

Mr. R. S. Hawes, III, writes:

*"OUR NRM EXTRUDERS HAVE ALWAYS GIVEN HIGH PERFORMANCE IN BOTH PRODUCTION AND QUALITY. ALSO, OUR RECORDS SHOW THEIR MAINTENANCE COSTS ARE LOW. WE'VE PURCHASED ONLY NRM EXTRUDERS SINCE THE FIRST ONE WE INSTALLED, AND INTEND TO STANDARDIZE ON THIS EQUIPMENT."*

## NATIONAL RUBBER MACHINERY COMPANY

NRM

*Creative Engineering*

General Offices and Engineering Laboratories, 47 West Exchange St., Akron 8, Ohio
East: 384 Getty Ave., Clifton, N. J.
West: S. M. Kipp, Box 441, Pasadena 18, Cal.
Export: Omni Products Corporation, 460 Fourth Ave., New York 16, N. Y.

2260

# ANNOUNCING NEW 508 ROVING

## *. . . makes reinforced moldings better-than-ever!*

Pittsburgh Roving #508 is not just an ordinary roving. It's a new, different and definitely superior roving. It has been treated by a "special" sizing process to provide better chemical and mechanical bond between glass fibers and the actual molding resin.

Because of this special treatment, Roving #508 outperforms other known types of rovings by producing consistently better preforms. In fact, *all* of the customers using #508 roving report "excellent results."

Why don't you check into the possibilities of using this superior Pittsburgh Roving #508 on your next molding job?

Complete information on standard packages and sizes is readily available—simply contact our executive offices or our district sales offices in Chicago, Cincinnati, Cleveland, Detroit, New York or Philadelphia. Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pennsylvania.

FIBER PG GLASS

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

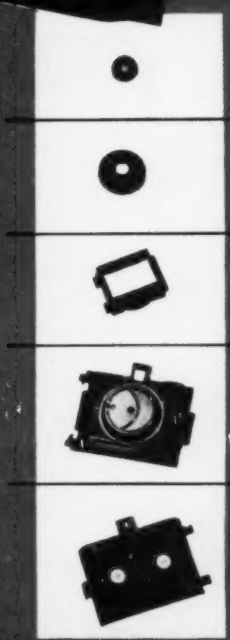
# BALANCING

## COST and QUALITY

**custom injection molding by**

# Ideal



KEEPING A STRICT EYE on costs and still producing a camera that really does a nice job of taking pictures requires a heap of engineering ingenuity and production know-how.

Proof that Ideal Plastics is equal to the challenge is this low-cost camera, injection molded for Cardinal Corp., Long Island City 1, N.Y. The unit is molded of shiny black styrene in five parts which are later assembled with a lens, a shutter and other components.

Ideal is a master of all the tricks and shortcuts for holding costs to a minimum. That holds true for moldmaking, for molding and for fabricating.

Whether your product is a low-priced item demanding inexpensive mass-producing, or a higher grade of merchandise where quality considerations are most important, Ideal is set up to injection mold it. Naturally, we do any or all of your assembling, finishing and decorating.

For full information on Ideal's outstanding custom injection molding service contact A. C. Manovill, Vice-Pres. in Charge of Sales. IDEAL PLASTICS CORPORATION, 184-10 Jamaica Ave., Hollis 7, N. Y. Phone: AXtel 7-7000.

*Better Molded Plastics* Ideal *for Industry & Home*



Plastic parts for Ansco cameras are produced on this mold of Crucible CSM 2 by Sylvania Electric Products, Inc. The mold designer and builder was Alex Primas.

*Intricate mold of*

**CRUCIBLE CSM 2**

*forms Ansco camera parts*

This intricate six-cavity mold of Crucible CSM 2 mold steel produces small plastic parts for the flash holder of an Ansco camera.

It's an exacting molding operation, for the parts must be perfectly uniform and interchangeable. Success of the job depended upon a combination of excellent mold and part design, skilful mold building and mold operation and mold steel of the highest quality. That's why Crucible CSM 2 tool steel was chosen.

Whether your application requires a mold as complex as this one, or one of several tons, you can rely on Crucible. For Crucible mold steels are actually tool steels . . . produced in the country's foremost tool steel mill. So check with your Crucible representative. He can tell you how Crucible CSM 2 fits your job, and see that it's shipped *fast* from local stocks.

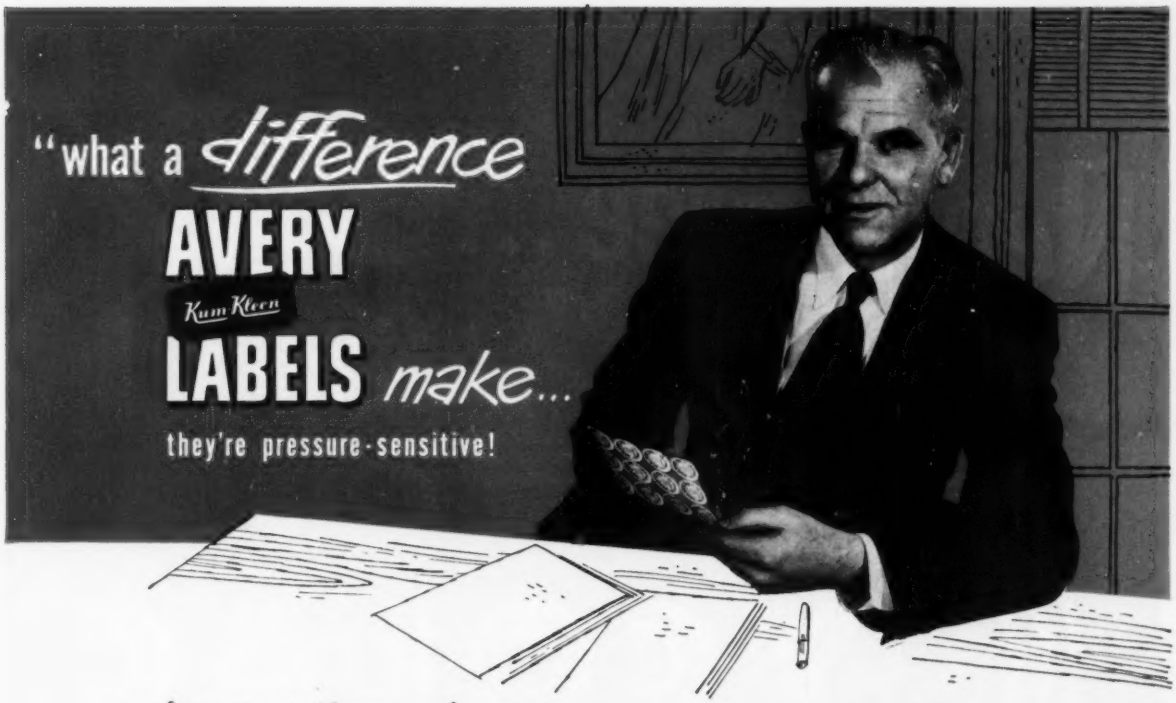



54 years of Fine steelmaking

**CRUCIBLE** first name in special purpose steels

**MOLD STEELS**

CRUCIBLE STEEL COMPANY OF AMERICA · TOOL STEEL SALES · SYRACUSE, N. Y.



"what a *difference* AVERY Kum Kleen LABELS *make...*

they're pressure-sensitive!

*...and save us time and money —in every department!"*

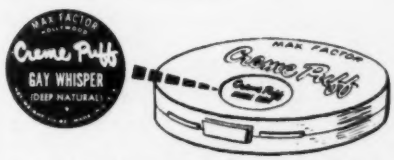
■ On the production line or on the product... in the shipping department, warehouse or office...engineering, inspection or research...in maintenance or management...every place you need to mark or label, Avery can save you time and money—can simplify and speed your work.

■ Avery Pressure-Sensitive Labeling is different because there's no licking or moistening ...no sticky or messy fingers...and no waste motion. They're self-adhesive...on at the touch of a finger—and they're tight, right now!

■ Avery Dispensers—either manual or electric—are available to give you low cost, dependable labeling. They're inexpensive to own and operate...need no special or skilled labor. They'll work into any production line—at any desired speed.

■ Write today for details, free samples and case histories of *Avery Pressure-Sensitive Labeling!*

**SPECIFICALLY SPEAKING...**




Few firms have as efficient production lines as Max Factor Hollywood! One, for example, easily handles more than 25,000 plastic containers in 6 hours. And only two labeling stations, each equipped with one Avery electric dispenser, handle this job quickly and easily.

Yes, Max Factor uses Avery Labels by the millions each month...and for a good reason: Avery Kum-Kleen permits extra high-speed labeling of their quality cosmetic products, *plus* an attractive appearance worthy of the legendary name—*Max Factor Hollywood!* Avery Labels can help you, too...whether you use 30 or 30,000 labels a day. Try 'em—they *are* different!




**AVERY ADHESIVE LABEL CORP., Custom Div.** 128

117 Liberty Street, New York 6 • 608 South Dearborn Street, Chicago 5

1616 S. California Ave., Monrovia, Calif. • Offices in other principal cities

☐ Please send case histories and free samples ☐ Have the Avery Label man call

*Name*_____

*Company*_____

*Address*_____

*Our Business Is*_____

# Nerve-Free...



# CYCOLAC®

THE *New* HIGH-IMPACT
THERMOPLASTIC RESIN

## Never misses the PRODUCTION TARGET

Cycolac is free from nerve or shrinkage; with a high in impact-resistance and heat-distortion temperature plus a low brittle point. Resistant to many oils, solvents and corrosive chemicals. Very light - Sp. Gr. 1.01 . . . dimensionally stable . . . soluble in selected solvents for potential coatings applications. Readily injection-molded.

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Marbon

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# UNIFORMITY
## Makes The Big Difference In
# LAMINATION FABRICS





# MT. VERNON EXTRA
## Gives You Greater Fabric Uniformity



Checking evenness of sliver with linear regularity tester. One of a series of laboratory controls throughout production to assure fabric uniformity in all Mt. Vernon-Woodberry products.

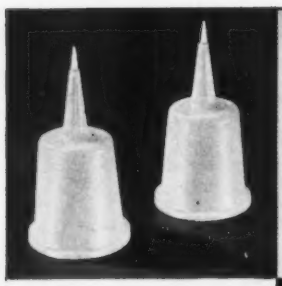
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**FABRICS ENGINEERED TO FIT YOUR NEEDS**

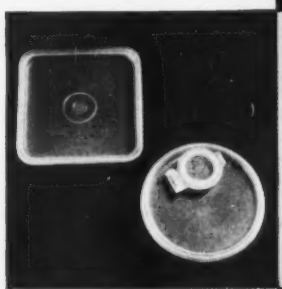
Need adaptation of an existing fabric to your special purposes? Or creation of an entirely NEW fabric—cotton, synthetic or blend – to meet your specifications? Mt. Vernon-Woodberry's staff of textile engineers is available on request to help you with your problems in development or application of industrial fabrics.





# NOBODY HAS AS MUCH EXPERIENCE AT MOLDING POLYETHYLENE AS TUPPER!





Tupper Seals are air and liquid-tight flexible covers. The famous Pour All and Por Top covers are designed for easy dispensing. They are made in sizes to fit all Tupperware containers.







When equipped with Tupper Seals, Tupper Canisters, Sauce Dishes, Wonder Bowls, Cereal Bowls and Funnels in various sizes are the most versatile reusable containers you have ever seen.

The logical molder for you to consult regarding that product or package of yours which is to be made of polyethylene is Tupper. Tupper has done more than any other molder to make molded polyethylene a practical reality.

Aside from having designed, patented, and promoted successful seals, closures, and dispensers for polyethylene containers, the Tupper Corporation has vast experience in *every phase* of polyethylene packaging and polyethylene injection molding. This experience will be of major importance in improving your product, in reducing your costs, when Tupper goes to work for you.

Tupper's combination of experience, technical ingenuity, and the most modern equipment is at your service for the custom molding of your product in polyethylene. You can do no better than the best ... and the best at molding polyethylene is Tupper!

TUPPER! TRADE MARK

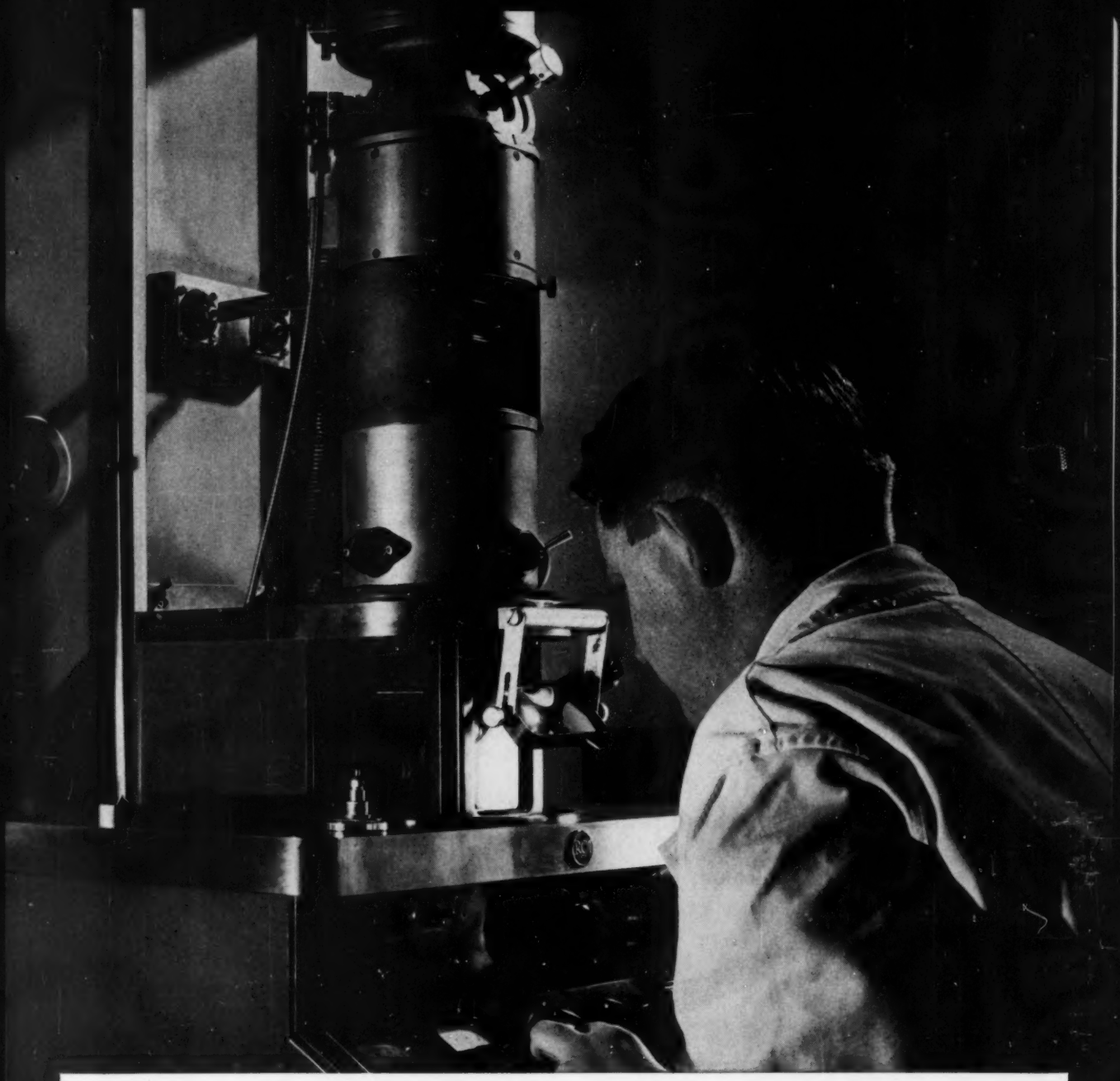
**TUPPER PRODUCTS ARE FULLY PROTECTED**

About 150 United States and foreign patents and patents applied for, plus numerous trademarks and copyrights, cover the design and manufacture of the various types of Tupper Seals and other Tupper Products. Unauthorized manufacture of items covered by Tupper patents will subject infringers to prosecution.

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*Manufacturers of* — CONSUMER, INDUSTRIAL, PACKAGING AND SCIENTIFIC PRODUCTS

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Showrooms: 225 Fifth Ave., N. Y. C.
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# The "Electronic Look" that enlarges 21,000 times!

When you step up the size of a pigment sample 21,000 times, you get an accurate picture of its physical properties. That's why Glidden research technicians use a powerful electronic microscope for these examinations.

This is just one of the many control tests made frequently throughout the production process to insure constant pigment uniformity. It's this Controlled Quality that makes Glidden pigments the finest available anywhere—and, which assures your complete satisfaction with Glidden Rutile and Anatase Titanium, CADMOLITH Reds and Yellows, SUNOLITH Lithopones.

Write now for detailed information on these and other products of Glidden Planned Research.

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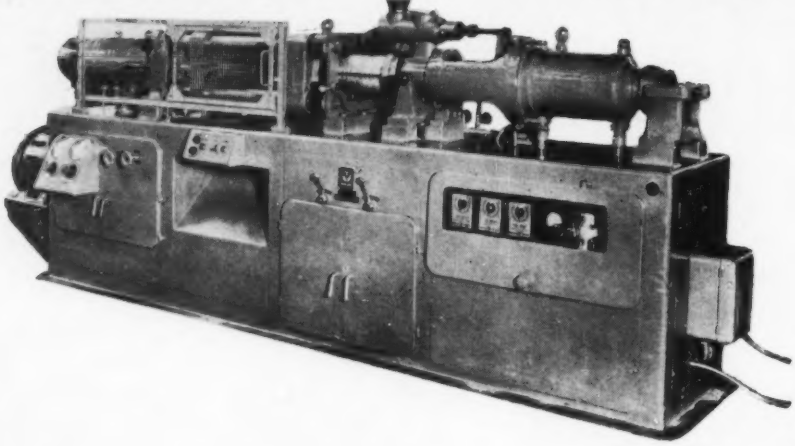
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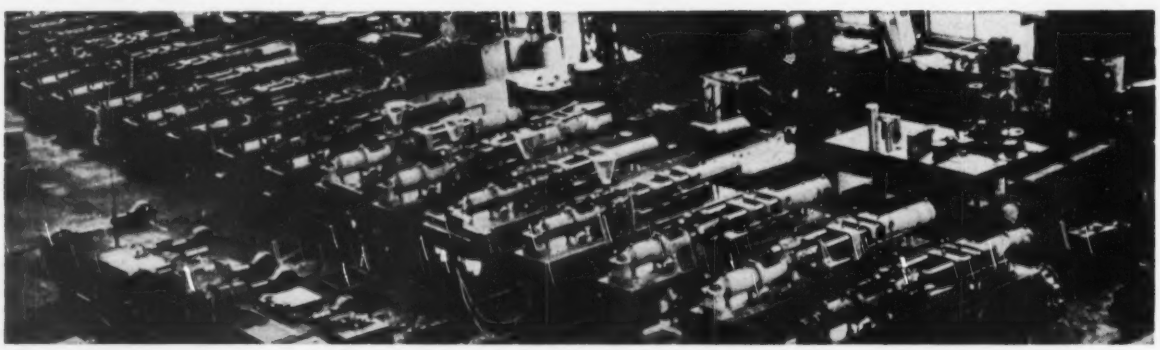
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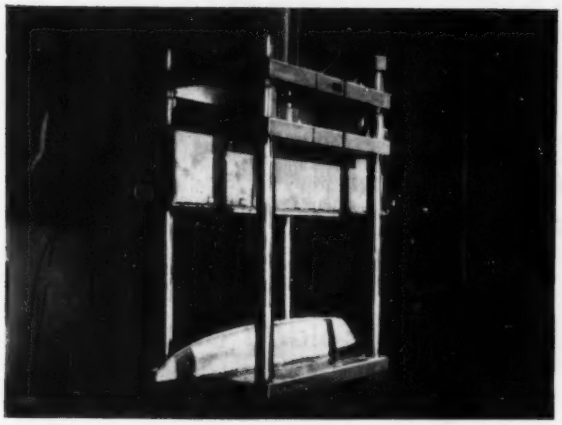
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60 Beaver St., New York 4, N. Y.
Tel.: Digby 4-0216-9

# users report big savings with sprayed metal tooling





*Photos courtesy Narmco Mfg. Co., San Diego, Cal.*

Typical glass laminated part produced from sprayed metal tooling in press shown. Match molds for this jet aircraft wing tip were built up with alternating layers of sprayed aluminum and bronze over sprayed zinc base and backed with copper tubing, reinforced and insulated with laminated glass cloth. Tubing carries steam for cure, after which cold water is used to chill male for next layup.



## new bulletin provides data round-up on current successful applications

Reports from users of sprayed metal tooling on recent successful applications form the basis for a new data bulletin, now available without charge. These case histories demonstrate the substantial savings in time and money over other tooling methods, point up possible pitfalls that can be avoided in tool design and fabrication.




Data covers general procedures, describes and illustrates tooling now in use and plastic production parts. Write for a copy of this new data bulletin, or use the handy coupon below.

**METALLIZING ENGINEERING CO., INC.**
1119 Prospect Ave. Westbury, L. I., New York
In Great Britain: METALLIZING EQUIPMENT COMPANY, LTD. Chobham near Woking, England

**Don A. Watson**
**METALLIZING ENGINEERING CO., INC.**
**1119 Prospect Ave., Westbury, L. I., New York**

Please send me free copy of Bulletin 111 Sprayed Metal Tooling. No obligation, of course.

NAME_____

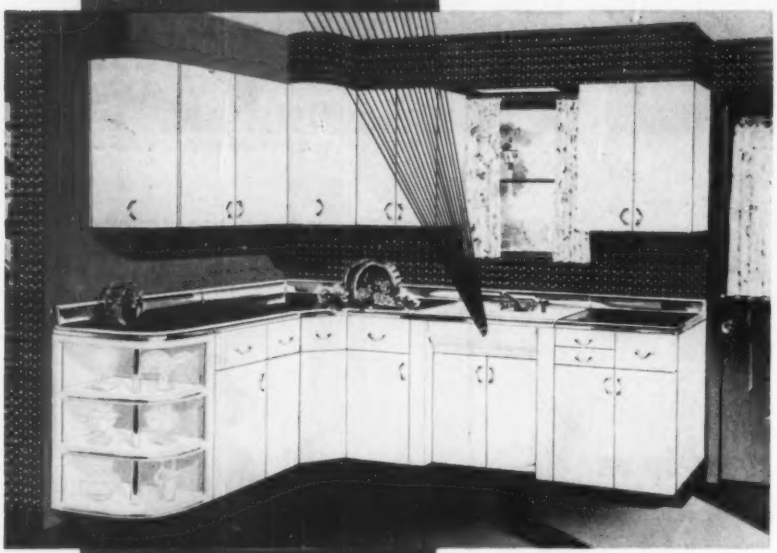
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molded and finished in . . .

**ERIE**
**Three-Dimensional Plastics**




Proud of your product! Make its identification an added attraction—as permanent as it is beautiful—with an ERIE Three-Dimensional Custom Molded Plastic emblem.

The Mullins Manufacturing Company has identified their new Diana Ensemble Youngstown Kitchen sinks with a rich medallion depicting the Roman goddess, Diana, in gold relief against a striking ruby-red background framed in gleaming chrome.

ERIE Three-Dimensional Plastics name plates and trademarks identify many nationally famous products. For execution of your ideas, or for help in formulating them, come to ERIE . . . the pioneer in custom injection molded plastics.

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**ERIE RESISTOR CORPORATION** . . . PLASTICS DIVISION

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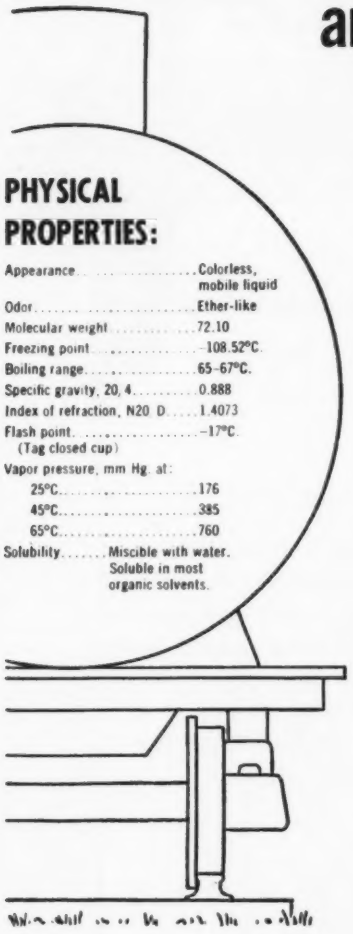
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**NOW AVAILABLE IN TANK-CAR QUANTITIES...**

# Du Pont Tetrahydrofuran

## —powerful solvent for polyvinyl chlorides and other vinyl resins



### PHYSICAL PROPERTIES:

| | |
|---|---|
| Appearance | Colorless, mobile liquid |
| Odor | Ether-like |
| Molecular weight | 72.10 |
| Freezing point | −108.52°C. |
| Boiling range | 65-67°C. |
| Specific gravity, 20/4 | 0.888 |
| Index of refraction, N20 D | 1.4073 |
| Flash point (Tag closed cup) | −17°C. |
| Vapor pressure, mm Hg. at: | |
| 25°C. | 176 |
| 45°C. | 385 |
| 65°C. | 760 |
| Solubility | Miscible with water. Soluble in most organic solvents. |

### USE ITS HIGH SOLVENT POWER TO FORMULATE:

- Fabric coatings
- Plastic sheet coatings
- Transparent films
- Adhesives
- Printing inks
- Lacquers

With tetrahydrofuran, it's easy to dissolve stubborn plastics, resins, and rubbers. This powerful solvent dissolves high molecular weight polyvinyl chlorides and vinylidene chloride copolymers at room temperature—gives solutions with high solids content at working viscosities.

**THF** may also be useful as a solvent in the formulation of lacquers, adhesives, and printing ink compositions. It is also suggested for use in the production of clear, light-colored coating compositions for fabrics and plastic sheets.

**EXCELLENT ADHESIVES** for sealing polyvinylidene chloride sheets and bags can be made from a 10% solution of vinylidene chloride copolymer in tetrahydrofuran. Polyvinyl chloride sheets can be combined with an effective adhesive made from a 10% solution of polyvinyl chloride in tetrahydrofuran.

**TETRAHYDROFURAN-WATER MIXTURES** have, in some applications, a combined solvent power greater than either of the two components. The tetrahydrofuran/water azeotrope, containing 5% water, may be suitable for many solvent uses.

**A SOLVENT ACTIVATOR,** tetrahydrofuran greatly improves solvent power when mixed with less active solvents. For example, a 65:35 mixture of tetrahydrofuran and methyl ethyl ketone will dissolve polyvinyl chlorides at room temperature.

E. I. du Pont de Nemours & Co. (Inc.), Electrochemicals Dept., Wilmington 98, Delaware.

***Mail coupon for more information***

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REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Please send me more information on tetrahydrofuran for use in the following applications:

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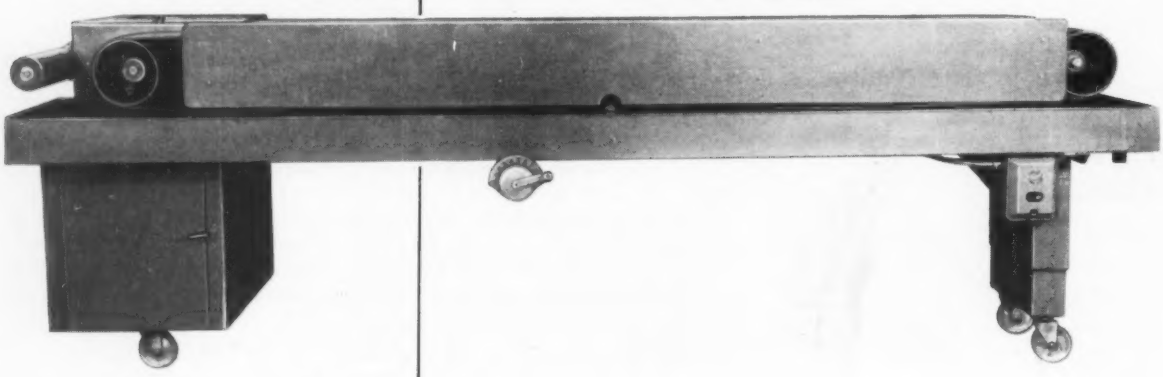
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# Robbins

# PLASTICS EXTRUSION EQUIPMENT

Variable speed drive provides a wide range of uniform belt speeds to maintain exact dimensional tolerances for various extruded shapes.

**CUSTOM EXTRUSION DIES • WATER TANKS • FORMING RACKS CONVEYORS • PIPE COILING MACHINES • PIPE HAUL-OFF UNITS AND PIPE SAWS • UTILITY SPOOL WINDERS • SHEET HAUL-OFF UNITS SHEET CUT-OFF SAWS and SHEARS**



Power driven take-off roller prevents extrusions from collecting at end of conveyor.

Motor base cabinet has doors on two sides for easy maintenance of motor and drive.

Two extra guide bars in water tank permit flexible extruded material to run over belt, down through water tank, back over belt—as often as necessary—for proper cooling.

Rigid all-welded construction assures years of maintenance-free operation.

**ROBBINS CONVEYOR MODEL NO. R-612**

Robbins Conveyor is available in 11 ft. and 20 ft. lengths with either 6" or 12" belt widths. Deep built-in water tank. Powered by ½ h.p. variable speed drive providing uniform belt speeds from 2 to 170 feet per minute—remote speed control. Blower and water spray equipment easily attached. Conveyor has vertical adjustments and is mounted on 4 swivel casters for ease in handling. Special requirements easily incorporated into basic design.

Consult Robbins' Technical Service for help on your plastic extrusion problems. We specialize in the design and manufacture of shop-tested dies, heavy duty equipment, accessories.

*never say die*
*. . . say ROBBINS die*

Robbins

**TOOL AND DIE COMPANY**

**1430 Mishawaka St. Elkhart, Indiana**



# New Vinyl Ink Dries Instantly

Well, not quite *that* fast, perhaps, but **adp**'s new vinyl ink dries so quickly that many users will choose to slow it down a little.

It's wholly new . . . just the right blend of pigment, resin, and solvent to give you a really fast-drying vinyl ink for gravure printing on vinyl film and sheet. It dries so quickly at normal printing temperatures, and adheres so tightly, that you'll get remarkable blocking properties.

Prints with much more brilliance than you expect from gravure printing, too.

This is a concentrated ink, ready and easy to extend with clear and solvent. Available in black, white, and ten other colors. We'll be glad to send you trial quantities.

**Acheson Dispersed Pigments Co.**
**2252 E. Ontario St., Philadelphia 34, Pa.**
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Striking examples of the efficiency of Battenfeld's Injection Moulders

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AT THE *Industrial Fair Hannover*
April 25th - May 4th 1954



**28 oz. in plexigum**
manufactured in W-Germany



**18 oz. in polyethylene**
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**18 oz. in polyethylene and polystyrene**
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**13 oz. in nylon**
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**14 oz. in nylon**
47 " long, 3.1/2 " wide and 3/16 " thick
manufactured in W-Germany

**ELECTRO-MECHANICAL DRIVE + PNEUMATIC FOLLOW-UP PRESSURE**
with built-in experience and advanced modern engineering

**BATTENFELD** builds this range

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| | | |
|---|---|---|
| BSM | 20 S | 0.7 oz. |
| BSM | 40 | 1.4 oz. |
| BSM | 40 S | 1.4 oz. |
| BSM | 100 | 3.5 oz. |
| BSM | 100 S | 3.5 oz. |
| BSM | 160 | 5.7 oz. |
| BSM | 300 | 10.7 oz. |
| BSM | 450 | 16 oz. |
| BSM | 450 Sp | 16 oz. |
| BSM | 800 | 28 oz. |
| BSM | 1000 | 36 oz. |

S – Speedy
Sp – Special construction

Vertical

| | | |
|---|---|---|
| BSM | 20 V | 0.7 oz. |
| BSM | 40 V | 1.4 oz. |
| BSM | 100 V | 3.5 oz. |
| BSM | 160 V | 5.7 oz. |

At the Fair with

| | |
|---|---|
| 3 BSM | 40 S |
| 1 BSM | 40 V |
| 1 BSM | 100 S |
| 1 BSM | 160 |
| 1 BSM | 300 |
| 1 BSM | 450 |

and
2 Compression Moulders
50 and 100 tons pressure
and the most convincing array of injected articles




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Trevarno offers you the uniform quality, economy and fast service of *one source* for all your material needs. Quality glass fabrics, woven from pure Fiberglas* yarns, are available in standard and custom weaves at low cost to meet your volume requirements. Our complete research and development facilities are at your service to develop impregnated fabrics and papers to meet your specifications. Trevarno "one company" operation assures precise control of processing, provides uniform quality throughout. And quality is paramount at Trevarno.

Trevarno
GLASS FABRICS

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# Another case for U. S. Royalite

American Optical Company—world's largest makers of ophthalmic products—knows that quality diagnostic instruments call for a quality case which meets a variety of needs. So—to provide their Ful-Vue Ophthalmic Diagnostic Sets with real protection—in cases both convenient and attractive—they've switched to U. S. Royalite.

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What's more, this new U. S. Royalite case can be washed inside and out with soap and water—or even sterilized!

*Eye opening?* This new U. S. Royalite case is vastly superior and AO reports that the smartly tailored safe storage it provides has contributed significantly to instrument sales. So it's not surprising that AO now plans to use U. S. Royalite cases for other products, too.

Maybe *you* have a case in mind where U. S. Royalite can be of help. Why not find out about it by writing to the address below.

**U.S. ROYALITE®**
TOUGH PLASTIC PRODUCTS

US RUBBER

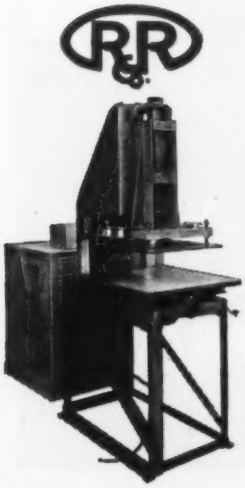
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# PLASTICS WELDED BY THERMATRON FIT INTO EVERYBODY'S LIFE!

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Thermatron®

HIGH FREQUENCY SEALING AND HEATING EQUIPMENT

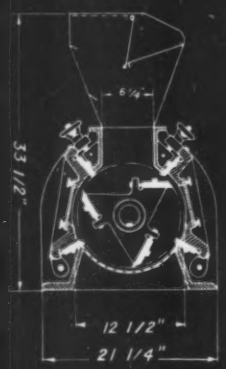
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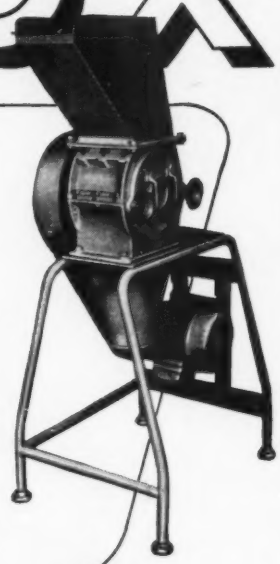






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### For Granulating All Injection Molding Compounds

- Quick disassembling and easy cleaning owing to perfect design and very simple construction.
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**CONDUX-WERK**
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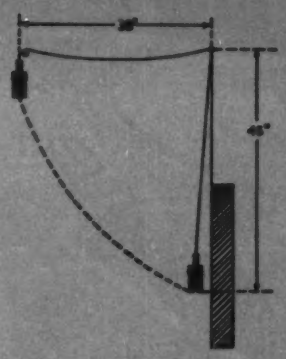


"Shock-resistant **G-E RUBBER-PHENOLICS**

**DEFIED THIS GRUELING IMPACT TEST**

—assured UL approval for our Plugmaster!"

*—reports Russ Towers, Engineer, Sperti Faraday, Inc., Adrian, Mich.*




**UL impact test: Plugs are exposed to 392 F for 24 hours, then dropped on 39" cords through a 90° arc against a maple block.**

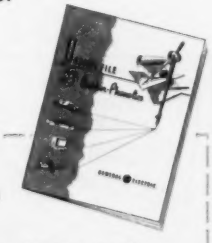
**"To obtain Underwriters' Laboratories approval, our Plugmaster cord plugs had to withstand 1,000 drops against a maple block. When our regular plastics failed to meet this test, we switched to General Electric rubber-phenolics. Result? Our cord plugs now averaged *a minimum of 3,000 drops*—and many were still intact after 10,000 impacts!"**



**Sperti Faraday Plugmaster cord plugs are molded by Peerless Molded Plastics, Inc., Toledo, Ohio, of G-E rubber-phenolics.**

## Where can YOU use shock-resistant G-E rubber-phenolics?

Shock-resistant G-E rubber-phenolics offer you an excellent opportunity to use plastics for applications where high impact strength is a "must." They produce parts which resist breakage in assembly and service, accommodate large metal inserts without cracking, and permit lightweight designs without heavy reinforcement. Where can *you* benefit by them? Ask your molder about these amazing impact materials or send the coupon for a *newly expanded* case history brochure.



*Progress is our most important product*

**GENERAL ELECTRIC**

**General Electric Company**
**Section 417-4A, Chemical Division**
**Pittsfield, Massachusetts**

Please send me a free copy of "Design File —G-E Rubber Phenolics." I want this information for: ( ) Reference purposes only ( ) An immediate application on_____

Name_____

Firm_____

Street_____

City_____ Zone____ State_____

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**Spencer is now assembling** what we hope will be the best technically-trained sales staff in the polyethylene industry. These men have been carefully chosen for their technical background and are now receiving further training. You'll be hearing from them before Spencer begins polyethylene production in 1955.

Here at Spencer Chemical Company we have a reputation for getting shipments of formaldehyde delivered to customers *on time.* Many folks tell us this reputation is well deserved. We would appreciate an opportunity to show you what we mean. Why not phone us tomorrow?

SPENCER®

*America's Growing Name In Chemicals*

SPENCER PRODUCTS: "Mr. N" Ammonium Nitrate Fertilizer • SPENSOL (Spencer Nitrogen Solutions) • HO-NO-MO (Spencer Herbicide) • Ammonia (Commercial and Refrigeration Grade) • Aqua Ammonia • 83% Ammonium Nitrate Solution Synthetic Methanol • Formaldehyde • Hexamine • Polyethylene (1955) FREZALL (Spencer Dry Ice) • Cylinder Ammonia

**SPENCER CHEMICAL COMPANY**

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## A SUPERIOR METHOD OF MAKING MOLDS FOR VACUUM AND DRAPE FORMING

... All metal construction
... made of chrome nickel alloy
... exceptionally fast delivery
... low in cost — high in quality

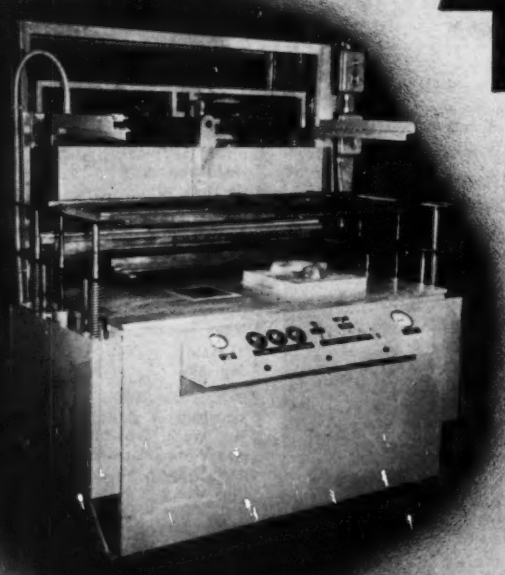
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There is none better for fast, accurate dependable production of both drape and vacuum forming. A complete self contained fully hydraulic unit. Can be operated either by manual or automatic control

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**Tamco Industries Inc.**

290 Broadway
Huntington Station, N. Y.
Phone: HUntington 4-9281

# MOSLO

## MODERN Automatic PLASTIC INJECTION MOLDING MACHINES

Before you buy any plastic molding machine, either fully automatic or hand operated, we urge you to investigate the features of the MOSLO line. These are the machines that are setting new and higher standards of quality production for many types of molding operations. They have the effective controls, rugged construction, reliability and speed that make profitable production possible, year after year, in all lines of the plastic molding industry. Savings extend to materials and mold cost as well as productive time.

We invite your inquiry. Write for complete information, stating your requirements. We will be pleased to arrange a demonstration.

**MODEL 73**

- 2 oz. injection capacity per shot
- 1200 cycles per hour
- 25 lbs. per hr. *plus* plasticizing capacity
- Molds 20 square inches of area *plus*
- Material hopper capacity—40 lbs.
- Mold opening 6"

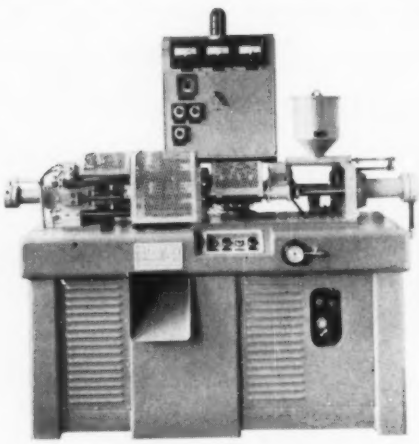
**MODEL 75**

- 2-3 oz. injection capacity per shot
- 740 cycles per hour
- 50 lbs. per hr. plasticizing capacity
- Molds 40 square in. of area
- 50 lbs. capacity of material hopper

This machine is available with mold arrangement and cycle to fit requirements of mold opening from 8 to 16 inches.

**MODEL 80**

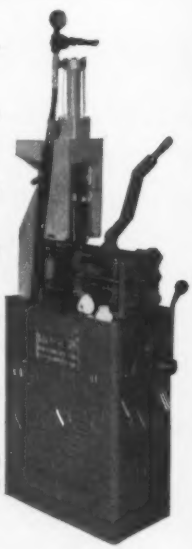
- 3-4 oz. injection capacity per shot
- 950 cycles per hour (dry run)
- 75 lbs. per hr. plasticizing capacity
- Molds 60 sq. inches of area
- 60 lbs. capacity of material hopper
- Mold opening 8"



MODELS 73 - 75 - 80

**MODEL HC 75**
**HYDRAULIC MINIJECTOR**

- ¾ oz. injection capacity per shot
- Mold size 6"x5"x 5⅛"
- 5.5 lbs. per hr. plasticizing capacity
- Molds 6 sq. in. of area
- 4 lbs. capacity of material hopper
- Vickers hydraulic pump equipment
- Ideal for small parts and die tryout



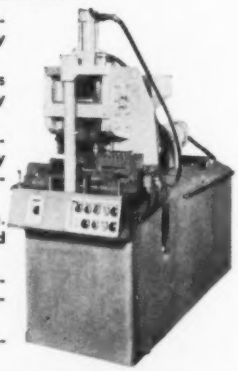
**¾ OUNCE HAND OPERATED MINIJECTOR**

- Ideal for schools, laboratories, die tryout and for making small parts
- ¾ oz. injection capacity per shot
- Mold size 6½"x2"x 2⅝"
- 4 lbs. capacity of material hopper
- Thermostatic control up to operating temperature 100° to 600°
- Available either as a bench model or floor model




**DUPLIMATIC MINIJECTOR**

- 2½ oz. injection capacity per shot
- 450 cycles per hour (dry run)
- 35 lbs. plasticizing capacity of material cylinder
- 20 sq. in. maximum mold casting area
- 25 lbs. capacity of material hopper
- Mold opening 2½"



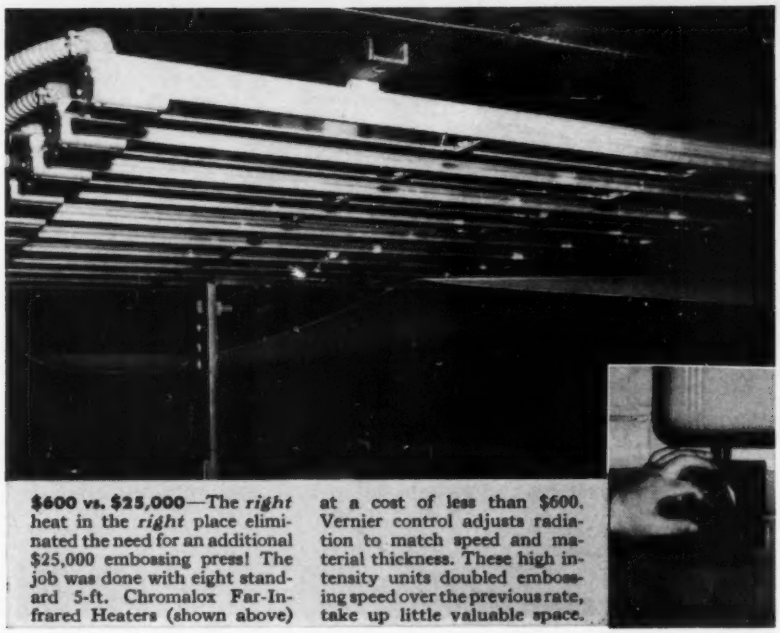
This is the machine that has become standard in electrical industry for insert work. Especially suited for high speed production of molded cord plugs, switch parts, etc.

**MOSLO MACHINERY COMPANY**

2443 Prospect Avenue — Cleveland 15, Ohio

# CHROMALOX Tips

PROFITABLE IDEAS FOR PLASTIC PROCESSING



**$600 vs. $25,000**—The *right* heat in the *right* place eliminated the need for an additional $25,000 embossing press! The job was done with eight standard 5-ft. Chromalox Far-Infrared Heaters (shown above) at a cost of less than $600. Vernier control adjusts radiation to match speed and material thickness. These high intensity units doubled embossing speed over the previous rate, take up little valuable space.

## UNIFORM, HIGH INTENSITY HEAT AND PRECISE CONTROL RESULT IN HIGH SPEED VINYL FUSING AND EMBOSSING

Many manufacturers of vinyl films are fusing cast vinyl in as little as ten seconds at speeds up to 100 yards per minute! They are obtaining this high speed production without expensive equipment and high pressure steam. Instead they use all-metal Chromalox Electric Radiant Heaters which are economical in initial cost and easy to install, even in existing equipment. Too, they occupy very little floor space.

Basic reasons for the success of Chromalox Radiant Heaters in processing vinyls are the high heat intensity, uniformity and the precise control possible with these far-infrared generators.

In usual production procedure, plastisol film requires one minute at 400°F. to fuse in a convection type oven. When the film is processed in a Chromalox Radiant Oven fusing takes place in ten seconds. In the manufacture of organisol vinyl films Chromalox Radiant Heaters perform equally well.

When the vinyl films require embossing or laminating, Chromalox Radiant Heaters do a better job, more quickly in both unsupported and supported films. In film up to 20 mils thick, high-intensity Chromalox Radiant heaters are placed on only one side of the film.

Full details for fusing, embossing and laminating cast and calendered materials are contained in "The Vinyl Report" listed in the right column. Write for your copy.

### BEING "COLOR BLIND" IS BIG HELP IN PROCESSING



White or black . . . transparent, translucent or opaque—it makes little difference when Chromalox radiant heat is on the job. That's because the radiation is in the invisible far-infrared wavelength that is absorbed with almost equal speed by all colors and surfaces. Even clear glass and plastics absorb far-infrared readily and heat up quickly.

### CHROMALOX APPLICATION DATA TO HELP SOLVE YOUR PROBLEMS

☐ **DEHYDRATING VINYL SHEETS**—How production was increased and rejects reduced in laminating vinyl sheeting between two pieces of plate glass. *Report R-121.*

☐ **FUSING VINYL TO CHIP BOARD**—How Chromalox Electric Radiant Heaters improved quality, reduced heating time and increased production 500 per cent. *Report R-129.*

☐ **HEAT FOR EMBOSSING CHLORIDE PLASTIC WEB MATERIAL**—How twelve Chromalox RAD-6303 Radiant Heaters replaced an inefficient heat source and resulted in lower operating costs, better end-products, and increased production by 50 per cent. *Report 132.*

☐ **FUSING PLASTISOL COATING TO MAKE IMITATION LEATHER**—How preheating, fusing and embossing are performed in a continuous in-line operation using standard Chromalox Electric Radiant Heaters, input controllers and other components. Chromalox Heaters were installed with minimum expense and less time. *Report R-143.*

☐ **VINYL TREATING CLOTH**—Case history of Chromalox Radiant Heaters being used to fuse vinyl into cotton fabric for garden gloves. *Report L-1068.*

☐ **DOUBLING EMBOSSING CAPACITY**—How a $600 investment in Chromalox Electric Heaters saved an expenditure of about $25,000 for additional embossing equipment. *Report L-1086.*

☐ **VINYL REPORT**—An authoritative paper on the use of Chromalox Far-Infrared Radiant Heaters for fusing and embossing cast and calendered materials.

☐ **10 ADVANTAGES OF CHROMALOX FAR-INFRARED**—A quick digest of the pertinent facts which make "color blind" far-infrared the ideal heat source for plastics processors. *CS-604-B.*

☐ **101 WAYS TO APPLY ELECTRIC HEAT**—A 32-page handbook illustrating and describing approved methods of electrically heating processing equipment, liquids, air, etc.

☐ **ELECTRIC HEAT FOR BETTER PLASTICS PROCESSING**—Case studies of how Chromalox Electric Heaters of all types have been used for drying, forming, shaping, fusing, laminating, molding and other uses in the plastics field.

☐ **CHROMALOX CATALOG 50**—Complete application details, specifications and other data on over 15,000 types, sizes and ratings of Chromalox Electric Heaters.

### CLIP AND MAIL TO:

Edwin L. Wiegand Co., Radiant Heater Div.
7503 Thomas Boulevard, Pittsburgh 8, Pa.

Please send me the material I have checked.

Name_____

Company_____

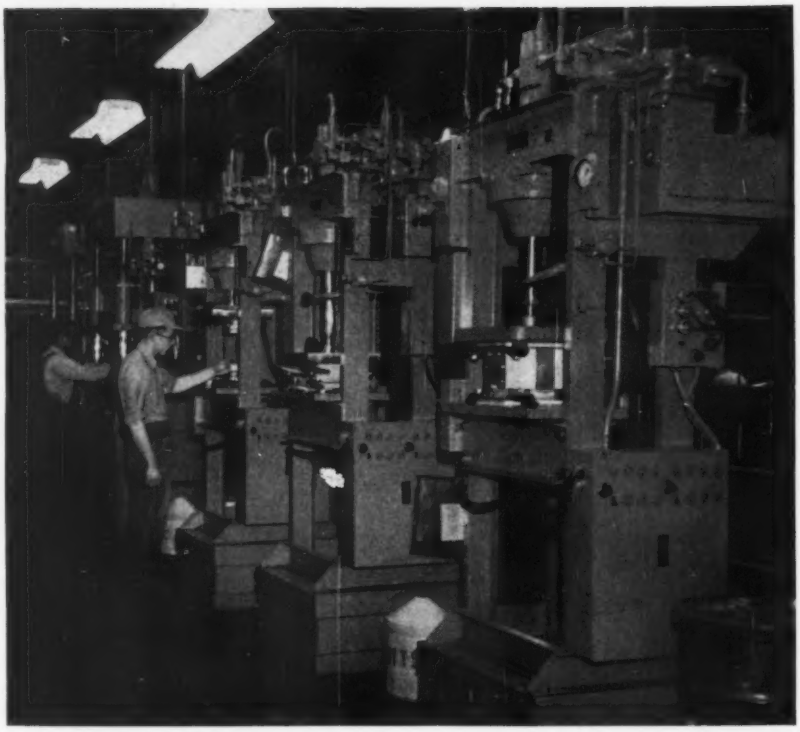
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IC-78

**OVER 400 DIFFERENT AIRCRAFT PARTS** *are molded on these Dake Plastics Presses*





*Dake 25-ton H-frame Hydraulic Press, set to by-pass at 15 tons*



*Dake Hydraulic Guided Platen Press also has 25-ton capacity*

**Housings,** junction boxes, map cases . . . these and hundreds of other aircraft parts are produced from Fiberglas laminate with this battery of Dake Plastics Molding Presses.

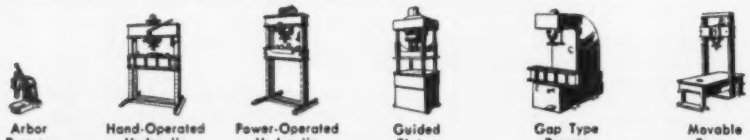
**Starting** with a few test parts, it quickly became apparent that these plastics had the strength, rigidity, and light weight required for aircraft use . . . and they could be produced at lower cost.

**Maximum production** savings came with the installation of the battery of five Dake Plastics Presses shown above. These presses are so accurate in their operation and so easy to control that quality improved steadily while production attained new high levels. As a result, plastics are now used for hundreds of additional parts.

**Dake Plastics Presses** are hydraulic, electrically operated, with dual palm control push buttons. They have adjustable pressure, electric timing, and automatic platen return, and many other features. Heated platens can be provided. For full information, write for Bulletin 273.

**Dake Engine Company, 648 Seventh St., Grand Haven, Mich.**

**DAKE PRESSES**



# ZENITH skill produces world's largest radomes for Lockheed "Sentinels of the Air"



The huge radomes above and below the Lockheed Super-Constellation, and the novel anti-icing radome in the nose, are products of Zenith's specialized technique and skill in reinforced plastics combined with electronics. These are the giant radomes which provide 360-degree "eyes and ears" for the U. S. Navy and Air Force, scouting far beyond the borders of the United States for early warning of enemy attack.

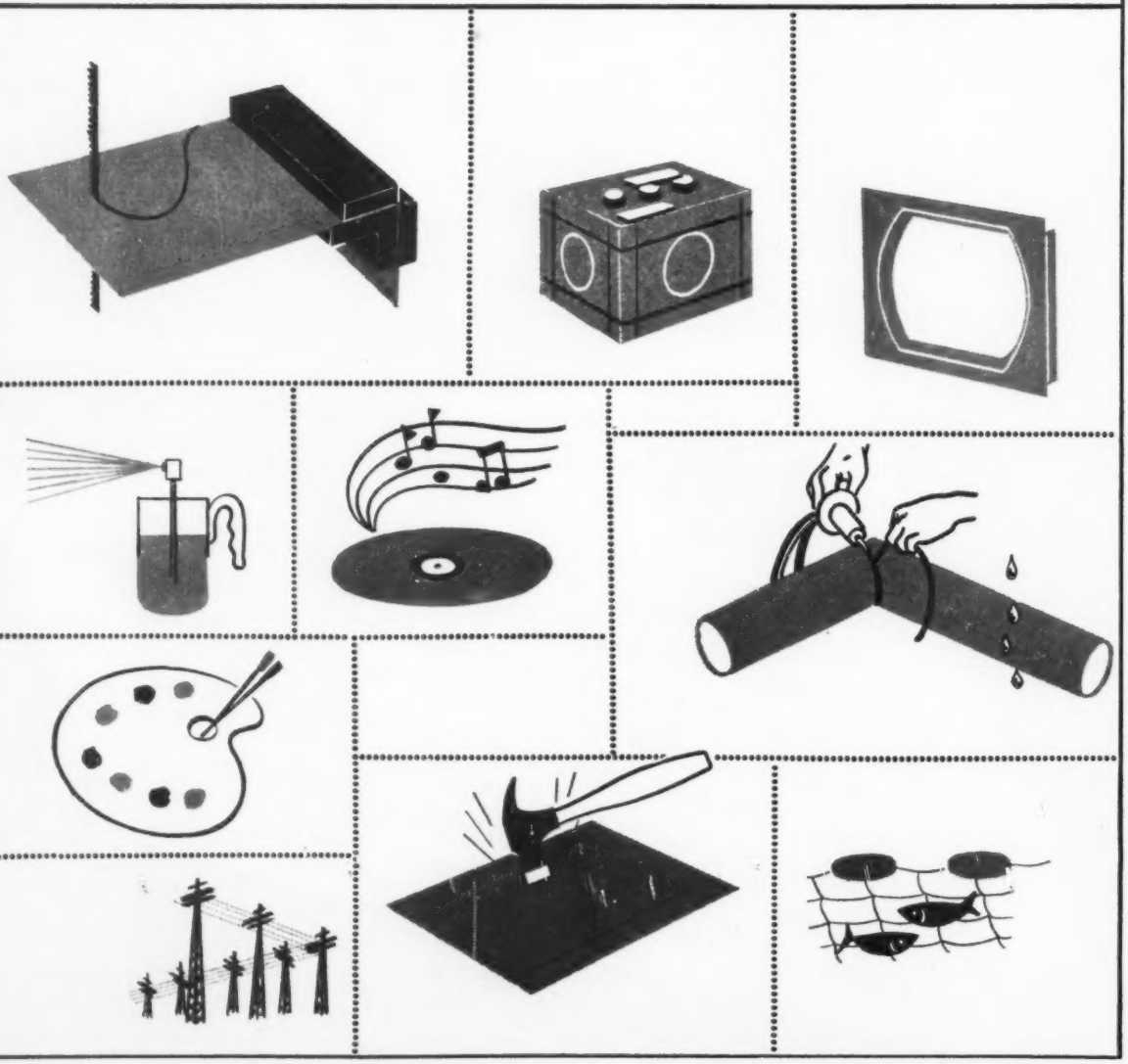
Zenith's unique background of experience in this highly specialized field is available on contact with Engineering Department—

ZENITH AIRCRAFT
Division of Zenith Plastics Co.

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**Versatile EXON Resins are performing for America's Leading Manufacturers in many fields!**



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# EXON RESINS!

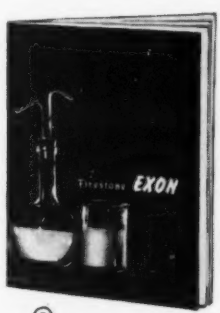
Each new EXON Resin is welcomed by industry as the basis for easily processed materials having excellent workability. EXON Resins have a remarkable record of achievement.

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For further information or consultation on the entire EXON line and its processing . . . call or write

**CHEMICAL SALES DIVISION**

Firestone Plastics Co., Pottstown, Pa., Dept. 2D, Division of Firestone Tire & Rubber Co.



# production efficiency

Shaw Plastic extruders are specially designed for the continuous production of tubing, flat and miscellaneous sections, and for the insulating and sheathing of cables. They are also suitable for processes requiring the delivery of a regulated amount of melted and molten materials for sheeting or coating purposes.



4½" PLASTIC EXTRUDER

The Shaw 4½" Plastic Extruder —one of the Shaw range.

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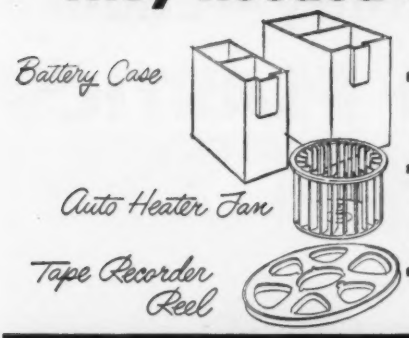
**FRANCIS SHAW & COMPANY LIMITED, MANCHESTER 11, ENGLAND**

TELEPHONE: EAST 1415/8 - - TELEGRAMS: CALENDER, MANCHESTER

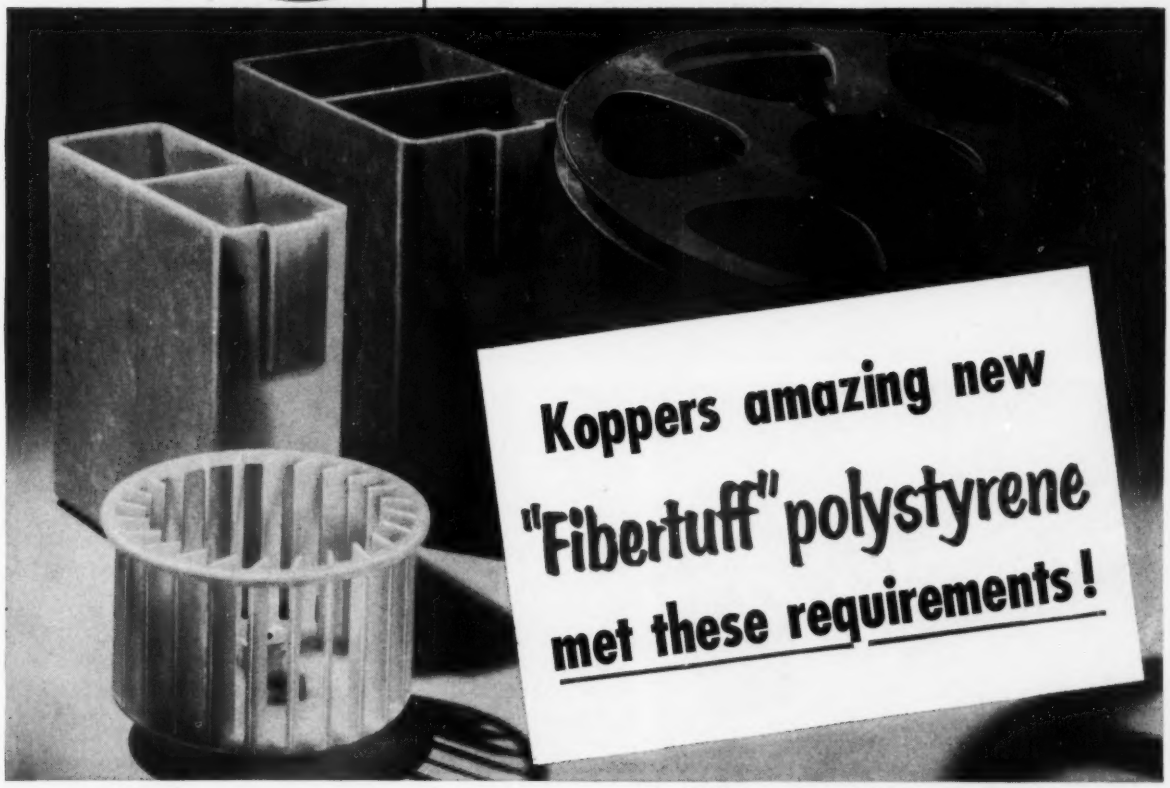
*LONDON OFFICE: 34 VICTORIA STREET, LONDON, S.W.1 'Phone: ABBEY 5077/8 'Grams: VIBRATE PHONE LONDON*

*Enquiries to* **FRANCIS SHAW (CANADA) LIMITED, GRAHAM'S LANE, BURLINGTON, ONTARIO, CANADA**

# They needed a plastic that was




- heat and shock resistant
- strong and rigid
- dimensionally stable




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| MC-405 | "Medium Impact," Easy Flow |
| MC-409 | "Medium Impact," Highest Heat Distortion Temperature |

• New "Fibertuff" Polystyrene is extra strong and rigid because it is reinforced with thousands of glass fibers. Make your products with "Fibertuff" Polystyrene and they'll keep their mold dimensions, and resist shock despite heat and cold. In addition, it is available in colors.

"Fibertuff" Polystyrene is a glass reinforced polystyrene designed for use in conventional injection molding equipment. It has been thoroughly tested in the field. For more information about "Fibertuff" Polystyrene, write to us today.

*Koppers Plastics Make Many Products Better and Many Better Products Possible.*

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# For precision and versatility—choose

# OWENS-ILLINOIS for PLASTICS



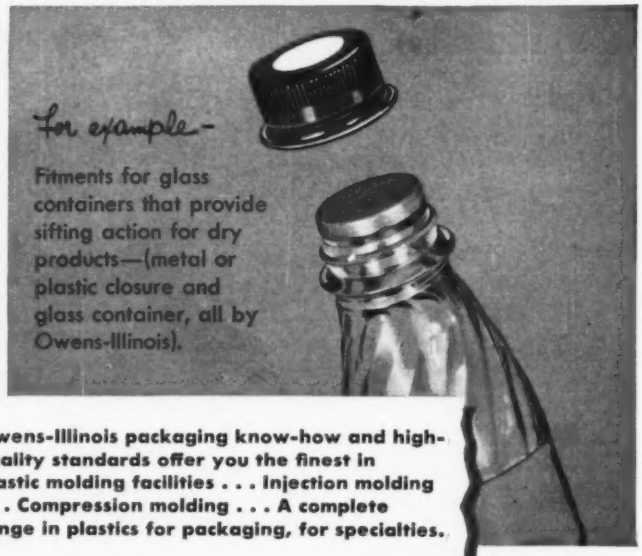
*for example—*

These spouts and caps are air- and liquid-tight. Designed for easy dispensing, these colorful fitments improve the sales appeal and reduce the cost of aerosol shaving lather containers. Owens-Illinois has extensive experience manufacturing plastic spouts for other products such as whipping cream, insecticides, sprays, etc.



*for example—*

This no-drip plastic fitment for liquid condiments simply slips on top of bottle. Plastic closure gives a positive, leak-proof reseal.



*for example—*

Fitments for glass containers that provide sifting action for dry products—(metal or plastic closure and glass container, all by Owens-Illinois).

**Owens-Illinois packaging know-how and high-quality standards offer you the finest in plastic molding facilities . . . Injection molding . . . Compression molding . . . A complete range in plastics for packaging, for specialties.**

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*Ask for our booklet on the sealing of boxes.*

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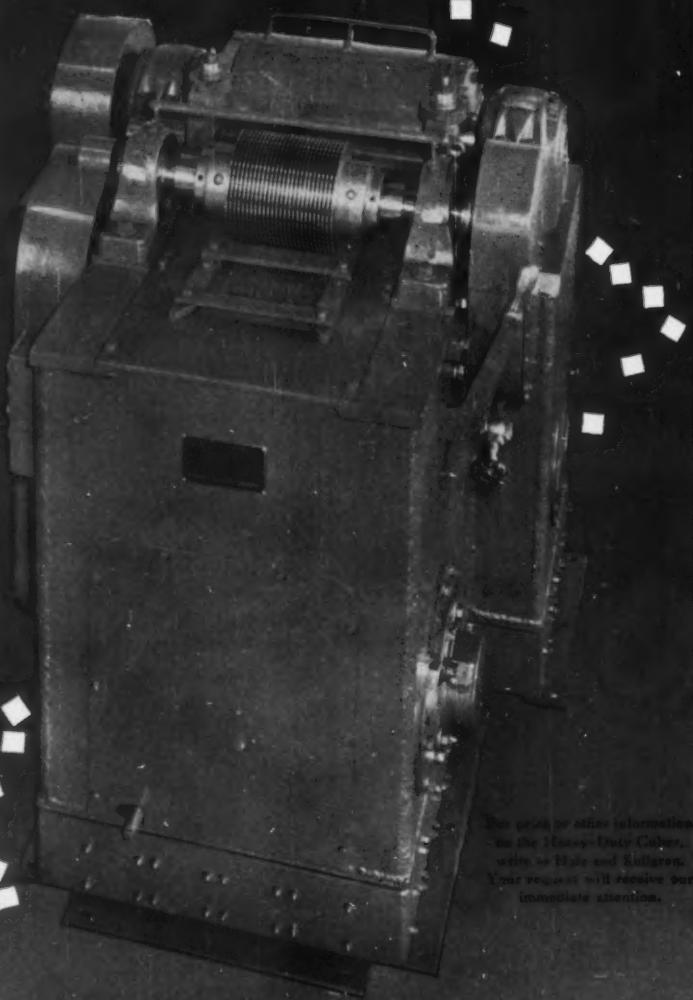
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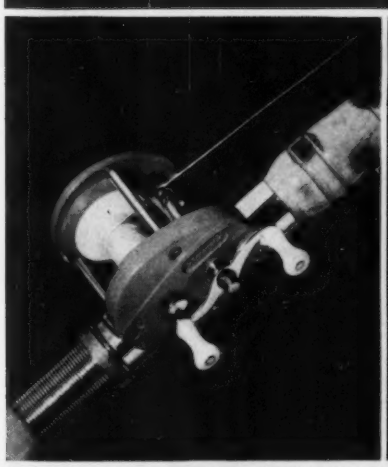
Your Inquiry

Whatever your requirements in plastics or rubber equipment or planning, Hale and Kullgren, Inc., can be of service to you. Give us an outline of your needs and we will give you prompt and authentic information.
P. O. Box 1231, Akron, Ohio

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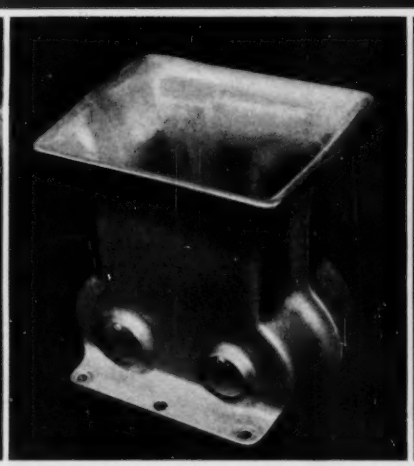
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# Fiberglas Reinforcements work wonders in molding compounds



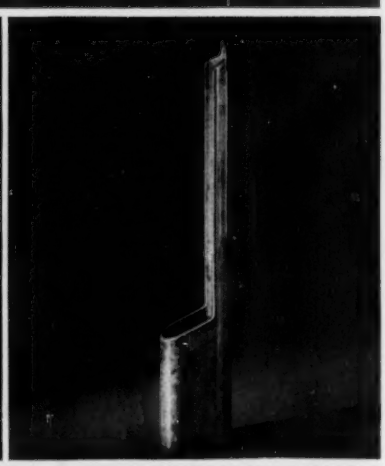
**And now, Fiberglas reels!**

Shakespeare's new line of fishing reels, made with Glaskyd Corporation's Fiberglas-reinforced *alkyd* molding compound, has the superior strength, corrosion resistance and dimensional stability of famous Fiberglas rods. New molding material gives speed and economy in production.



**Hamburgers from plastic!**

When Hollymatic Corporation redesigned their meat-molding machine, numerous metal castings were replaced by parts made of Thermaflow's Fiberglas-reinforced *polyester* molding compound. Result: a more modern look, easier cleaning, greater resistance to corrosion . . . and $15 saved per unit!



**Taking oil's temperature!**

Weksler Thermometer Corporation chose Durez's Fiberglas-reinforced *phenolic* molding compound for this Scoop Master tank thermometer. Compound combines fast, economical fabrication with the strength, durability and low thermal conductivity demanded by the petroleum industry.

Fiberglas* reinforcements, now available in compounds for compression, transfer and injection molding, will give greater strength, dimensional stability and heat resistance to *your* products, too. Investigate these compounds for tough jobs not yet done by plastics. Let your favorite molder submit his quotation. And for further information and sources of these materials, please write to:

**OWENS-CORNING FIBERGLAS CORPORATION**
Plastics Reinforcement Div., 598 Madison Ave., New York 22, N. Y.

OWENS-CORNING
FIBERGLAS

**Fiberglas is the trade mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers.*

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With every passing day, vacuum forming and deep drawing are getting a bigger play from companies interested in cutting their manufacturing costs and improving their products. And Nixon offers these companies the fullest range of thermoplastic sheet materials.

Nixon formable sheets come in a tremendous assortment of rigidity characteristics, colors, sizes, gauges and finishes. If your product needs a special formulation, we will gladly undertake to develop it.

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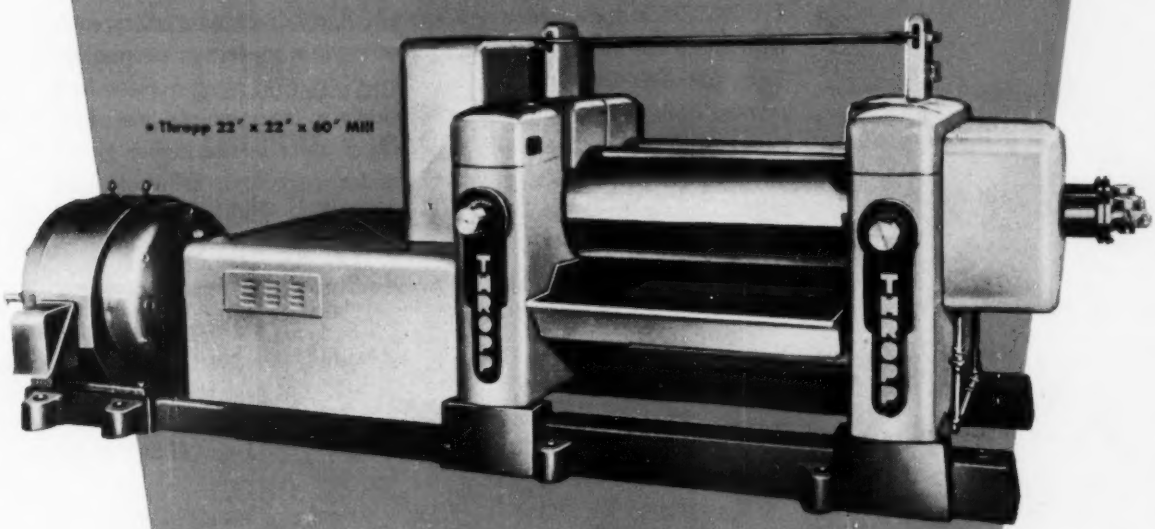
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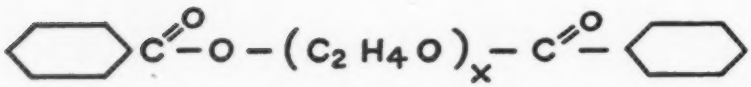
**The clean, streamlined design affords a new concept in milling—combining minimum maintenance and maximum efficiency with superior performance.**

*Send for further information.*

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# *announcing 8 new benzoate esters*

## WITH WIDE RANGE OF PROPERTIES



**How can they help you?**

TENNESSEE announces a new series of glycol dibenzoate esters, each with special properties that may improve your product or processing. They are *light-colored, stable, mild-smelling,* and have *high-boiling* points. Their property range varies widely in freeze points, viscosity, and solubility . . . especially *solubility of water* in the higher glycol members. *Suggested Uses*: plasticizers for polyvinyl, cellulosic and phenol-formaldehyde resins. Other potential uses: lubricants, textiles, leather, adhesives and flotation.

***Write on your letterhead to Dept. M-8 for experimental samples and technical data.***

## TYPICAL PROPERTIES OF NEW *Benzoflex* ESTERS

| Benzoflex Number | 9-98* | 2-45* | E-60 | T-150 | P-200 | P-300 | P-400 | P-600 |
|---|---|---|---|---|---|---|---|---|
| Chemical Name | Dipropylene Glycol Dibenzoate | Diethylene Glycol Dibenzoate | Ethylene Glycol Dibenzoate | Triethylene Glycol Dibenzoate | Polyethylene Glycol 200 Dibenzoate | Polyethylene Glycol 300 Dibenzoate | Polyethylene Glycol 400 Dibenzoate | Polyethylene Glycol 600 Dibenzoate |
| Color APHA | 100 | 50 | 50 | 100 | 100 | 150 | 150 | 300 |
| Boiling Pt. @ 1 mm. Hg., °C. | 195-200 | 200-205 | .... | 223-37 | 217-290 | 243-327 | 258 d. | 200 d. |
| Specific Gravity @ 25°C. | 1.129 | 1.178 | Solid | 1.168† | 1.158 | 1.150 | 1.145 | 1.141 |
| Freeze Point, °C. | <-35 | 28<br>16 | 70-2 | 47 | <-35 | <-35 | <-35 | 3.8 |
| Pour Point, °C. | -20 | -25† | Solid | Solid | -30 | -30 | -35 | Solid |
| Flash Point, °C. | 212 | 232 | 186 | 237 | 248 | 258 | 254 | 264 |
| Refractive Index @ 25°C. | 1.5282 | 1.5424 | Solid | Solid | 1.5252 | 1.5137 | 1.5077 | 1.4984 |
| Viscosity (cps. @ 20°C.) | 215 | 110 | Solid | Solid | 101 | 130 | 167 | 330 |
| Solubility, % @ 25° | | | | | | | | |
| In water | insol. | insol. | insol. | 0.05 | 0.80 | 0.14 | 0.70 | 0.78 |
| Water in | 0.45 | 1.0 | .... | .... | 2.3 | 8.3 | 16.5 | 32.0 |
| Aliphatic Hydrocarbons | sol. | sl. sol. | insol. | sl. sol. | insol. | insol. | insol. | insol. |
| Aromatic Hydrocarbons | sol. | sol. | sol. | sol. | sol. | sol. | sol. | sol. |

*—Available in commercial quantities. All others now available in development quantities only.
†—Supercooled liquid.

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fiber glass or plastic fabric . . . there's an Eastman machine of the right size and right power to do the job right.

For many fabrics, a Wave-Edge knife is most effective . . . and only Eastman's abrasive belts sharpen this type of edge correctly.

For straight line cutting . . . or fixed production line work, use the

**EASTMAN ROUND KNIFE**



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To begin with, fiber glass had the nasty habit of dulling knives quickly. Hence, the need was to retain the original sharpness of the blade during the cutting operation.

Here was where the Eastman Blue Streak came to the rescue. For unlike cutting machines using hollow-grinding emery wheels which put a thin, unsupported, concave edge on the knife, the Eastman Blue Streak FLAT abrasive belt sharpener retains the original V-shaped cutting edge throughout the life of the knife.

Result: cutting was easier . . . faster . . . and the volume of cutting per sharpening and per day was considerably increased.

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**EASTMAN MACHINE COMPANY, Buffalo 3, N. Y.** Agents in all principal cities

# Here's what FEDERAL TOOL learned about LESTERS



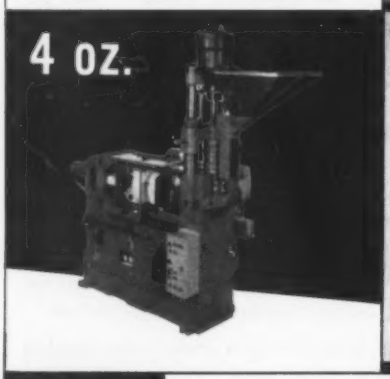
















It takes some doing, to arouse enthusiasm over a new molding machine in an old and experienced molding shop. But that's exactly what happened at Federal Tool Corp. in Chicago when their new Lesters went to work.

No wonder, when in several cases production was actually doubled! Oversize shots and oversize areas have been handled with ease. They even reduced part weights through the rigid Lester locking assembly.

As Mr. Ray Olson, plant manager says, "We were frankly surprised by the performance of the Lesters. We knew we were buying good machines, but we never expected such a wide margin of difference."

Write for complete specifications on the machine suited to your molding requirements and ask to receive the Lester-Phoenix house organ, "The Lester Press."

## LESTER INJECTION MOLDING MACHINES

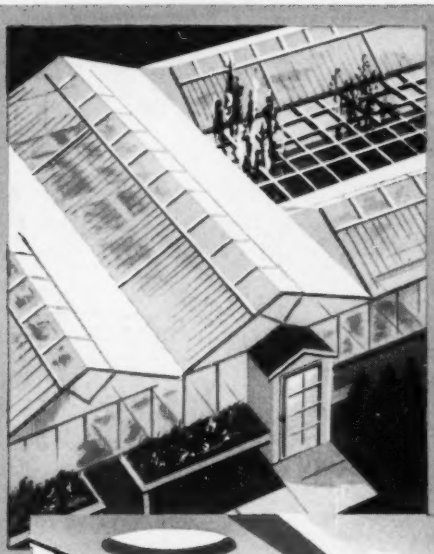
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**POLYESTER RESINS**



**are now ready for a thousand new uses!**

PITTSBURGH'S SELECTRON Polyester Resins are playing an important part in the development of new materials for building and decorating. They are being used in the making of clear and colorful panels that have a wide range of applications—from sidelights and skylights of greenhouses to decorative partitions that add sparkle and beauty to office or home.

**SELECTRON Resins give** these panels unusual weather resistance, easy moldability and exceptional light stability. Reinforcing fillers give them exceptional strength with low weight, impact toughness and dimensional stability. Being translucent, these panels diffuse daylight without glare. They possess low thermal conductivity.

**Above all,** these panels are very economical to use. They often cost only half as much to install as conventional materials. They are practically maintenance-free.

**SELECTRON Resins offer** almost endless possibilities to alert, progressive manufacturers. If you are designing a new product—or redesigning one you are now making—SELECTRON may help you make it lighter, stronger, more durable and, probably, at lower cost. We'd be glad to have one of our engineers discuss your problems with you without cost or obligation.

**Send For FREE Booklet!**

• Write, wire or phone today for our new booklet containing description of SELECTRON Polyester Resins and explaining many ways to use them. Pittsburgh Plate Glass Company, Selectron Products Division, Gateway Center, Pittsburgh, Pa.

**Just a few products in which Pittsburgh SELECTRON Resins are now used—**

Aircraft structural parts
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Kitchen containers
Fishing rods
Sinks
Street signs
Traffic signs
Fluorescent light fixtures
Television cabinets
Loudspeaker housings
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Molded chairs
Prefabricated houses and garages
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**Peco Injection Moulding Machinery is now well established throughout the world as equipment in which the best engineering skill and experience are combined with the latest developments in plastic technology.**

**A recent addition to the PECO range of machines for the plastics industry is the 2½" Universal Extrusion Machine which is illustrated above. This machine aroused much interest at the 1953 Plastics Exhibition in London.**

**Illustrated literature is available on all PECO products and will be gladly sent on request.**

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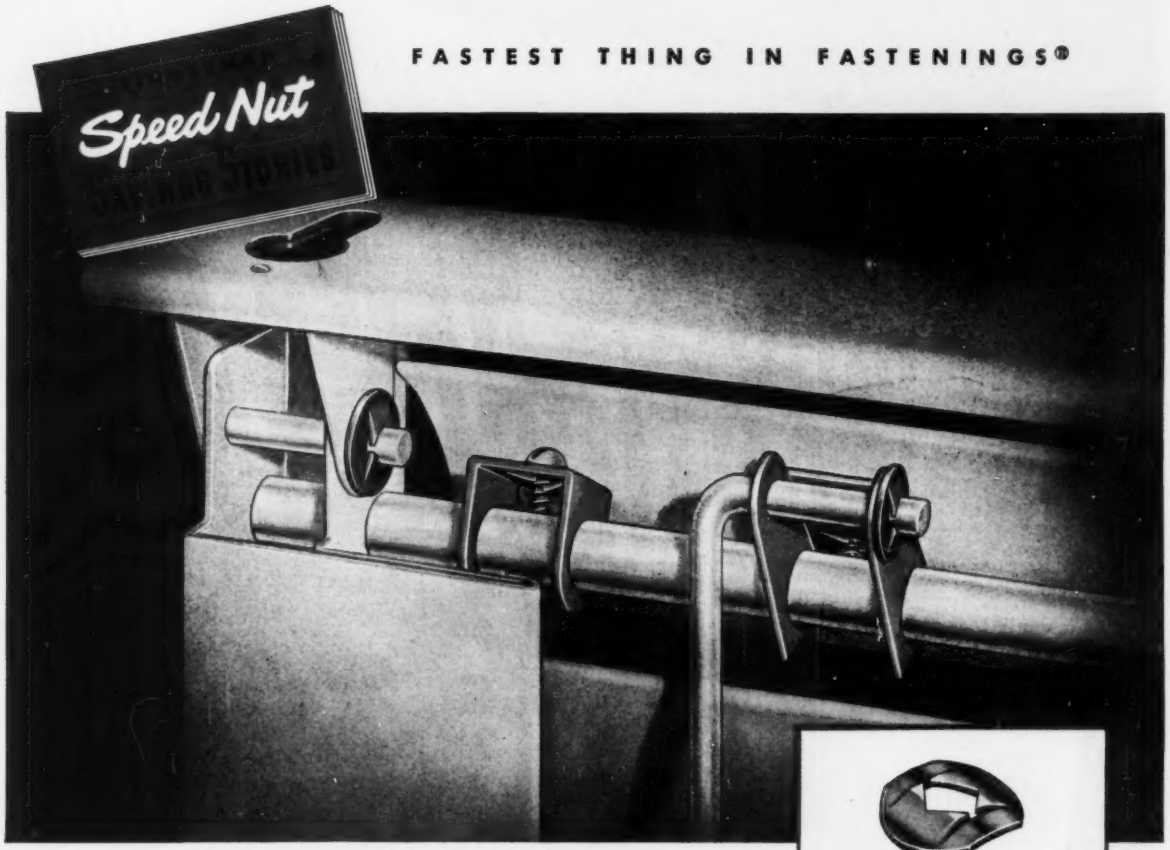
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## "New twist" cuts assembly costs 63% on Awnair Adjustable Awnings



How to assemble adjustable awnings faster, easier and at lower cost? This 3-way challenge was met recently by engineers of the Awnair Corporation of America, Wayne, New Jersey. Playing leading roles in this success were Tinnerman SPEED NUTS!

Standard Push-On type SPEED NUTS were recommended for eight fastening applications. And three specially developed SPEED NUT brand fasteners put a "new twist" in the awning adjusting mechanism. They provide lightning-fast, rust-resistant, rattle-proof attachments. They also eliminate costly sawing, drilling, tapping, clinching and sanding operations.

*The use of SPEED NUTS resulted in a 63% average assembly cost saving over former fastening methods, including a big 88% saving on one application!*

Your Tinnerman representative will be glad to help you locate fastening savings in your product assemblies. Ask him for complete details on our Fastening Analysis Service!




Write today for your copy of the new Tinnerman Fastening Analysis Service Bulletin No. 336:

TINNERMAN PRODUCTS, INC., Box 6688, Department 12, Cleveland 1, Ohio. *In Canada:* Dominion Fasteners, Ltd., Hamilton, Ontario. *In Great Britain:* Simmonds Aerocessories, Ltd., Treforest, Wales. *In France:* Aerocessoires Simmonds, S. A.—7 rue Henri Barbusse, Levallois (Seine).



# THE BIGGEST NEWS IN PLASTICS!




## The LEWIS "6" Injection Molding Machine

HERE'S WHY:

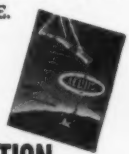
INCREASED CAPACITY . . . The Model "6" will plasticize up to 60 pounds of material per hour . . . mold 7-ounce shots of polystryene at the rate of 2½ per minute.

NEW CLAMPING MECHANISM . . . The exclusive LEWIS "HYDRA-LOCK", the most powerful mold clamp available, develops a 200-ton clamping pressure in tenths of a second.

ASSURED ECONOMY . . . Intricate parts formerly made on much larger machines can now be produced by the Model "6" at a fraction of initial and normal operating cost.

MAXIMUM SAFETY . . . Mold clamping device features over-center toggle mechanism . . . safety interlocks on gate . . . and emergency stop for positive safety.

In addition, injection pressures up to 15,000 psi . . . a compensating feed mechanism . . . automatic molding cycle . . . large platens . . . fingertip controls . . . and minimum maintenance combine to make the biggest news in plastics . . . THE LEWIS "6" INJECTION MOLDING MACHINE.



*Write today for Bulletin 102.*

LEWIS

**THE LEWIS WELDING AND ENGINEERING CORPORATION**

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## WE MAKE AND FABRICATE...

# STRONG, LOW-COST SPIRAL TUBING

Spiral Tubing, another outstanding C-D-F product, is an important new material for the progressive, cost conscious design engineer (and purchasing agent). It is a high strength plastic made from paper or fibre that is spirally wound, then impregnated with phenolic resin or insulating varnishes and carefully cured at high temperatures. The resulting tubes (round, square, rectangular or formed to special shapes) are stiff, sturdy, resistant to crush, with good tensile strength.

This unique product has good dielectric strength with low dielectric loss properties. Moisture resistance and dimensional stability is easily controlled in the manufacturing process. The wide variety of sizes, shapes, forms; the strength; low cost; ease of fabrication; speed of delivery; all combine to make C-D-F Spiral Tubing worthy of your investigation.

## PRIMARY APPLICATIONS

**COIL FORMS OF ANY SIZE OR SHAPE**
- for tuned or untuned RF, IF, oscillator, and other coils used in radio, television, electronic circuits
- for solenoids, relays, circuit breakers
- for transformers
- for permeability tuners

**INSULATORS**
- for selenium rectifiers
- for electric motors
- relays

**BUSHINGS OR SPACERS**
- armature shaft spacers
- for mechanical support

**SHIPPING PROTECTORS AND FOR SPECIALIZED PACKAGING**

**BOBBIN TUBES**

**BODIES FOR PAINT ROLL APPLICATORS**

**AS A COMBINATION MATERIAL**
- with other C-D-F high strength plastics or electrical insulating materials

## SIZES

The round tubing ranges from 3/32 to 8" ID, with wall thicknesses from .0075 to ¼". The minimum ID of square and rectangular tubing is ⅜", with 2⅛" the maximum ID. Wall thicknesses range from .010 to 3/32".

Standard lengths are from 2 to 4', with special sizes and grades, plain or impregnated, open for your discussion with our C-D-F sales and engineering staff.

## FABRICATION

Spiral Tubing is readily sawed, punched, drilled, tapped, riveted, stamped, painted, depending on the grade; it is suitable for automatic machine operations, but not recommended for conventional machine threading. Waxing or varnish impregnation to improve moisture resistance is usually done on the finished coils by the user.

## GRADE SELECTION

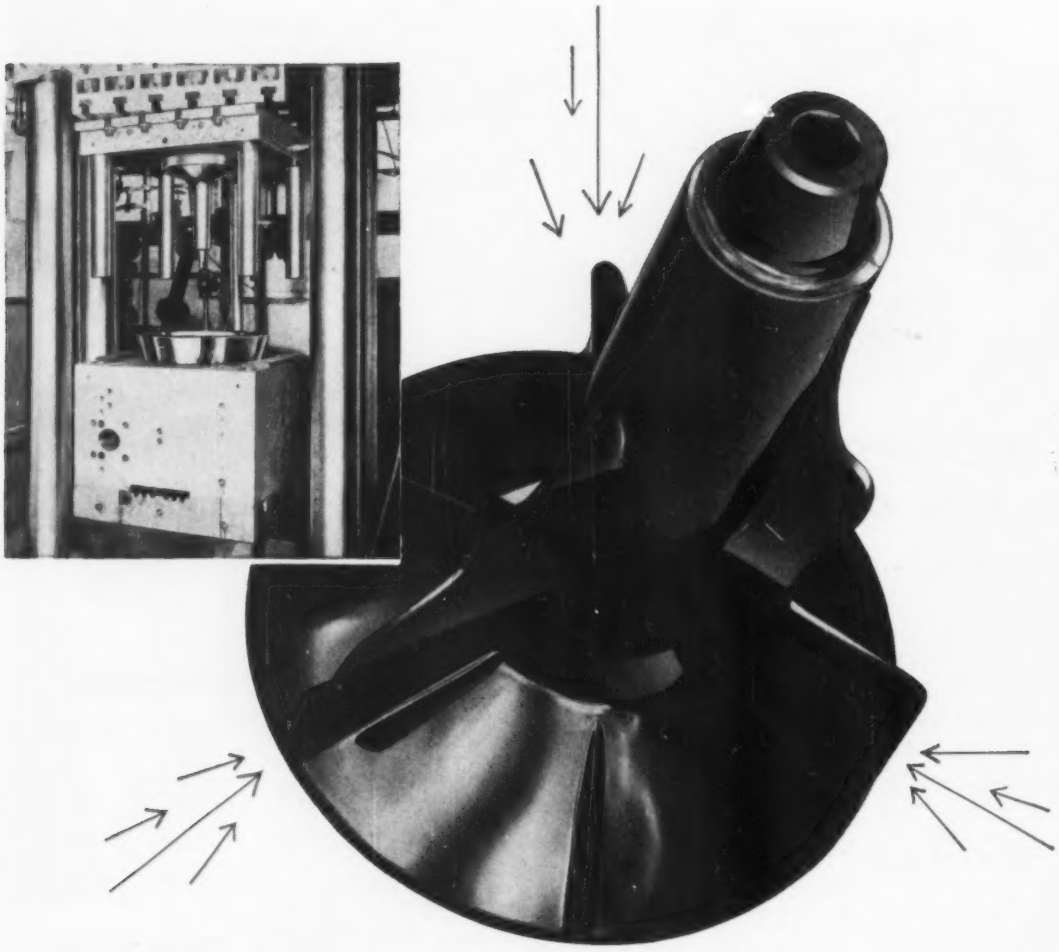
C-D-F has mass production facilities for both the manufacture and fabrication of eighteen distinct grades of Spiral Tubing. For example, there's a special punching grade, fine for punching rectangular or square holes near the end of the tube. A relatively soft tube is supplied for difficult stapling or riveting. C-D-F makes high strength automotive electrical bushings from a very hard tubing with high axial compressive strength. Combinations of kraft, chipboard, Diamond "fish paper" Insulation, and other materials are available.

**FORMS: ROUND • FORMED • FORMED AND NOTCHED • SQUARE AND RECTANGULAR**

**See our general catalog in Sweet's Design File for more data, the address and telephone number of your nearest C-D-F sales engineer. Also, write for C-D-F Spiral Tubing folder ST-53, (a workbook showing grades, applications, properties), free test samples, or send us your print for quotation.**

Continental-Diamond Fibre

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NEWARK 28, DELAWARE



## how PRP puts a new twist in *Phenolic moldings*

When Whirlpool Corporation laid down specifications for this unique Surgomatic agitator, some of the molding industry's oldest producers threw up their hands, said it couldn't be done. Exceptionally undulated vanes which provide a more efficient washing action required a "new twist" in plastic molding.

But PRP engineers went to work, added specially designed heavy-duty equipment to rapidly produce this type molding. A chrome-plated, 5¾ ton die that opens like a three-petaled flower and mounts on PRP's new, thousand-ton presses, turns out the Whirlpool agitator and similar parts in quantity.

Answers to problems that "can't be solved" and volume, on-schedule production of phenolic, urea, melamine or alkyd moldings are typical of PRP's flexible operation.

And it's yours to command. We've the heavy-duty equipment to furnish you custom moldings, large quantities or small, and deliver them right to your door in our own trucks. Write, wire or call for conscientious PRP service . . . or send for our plane, ready to fly you directly here for discussion of your particular plastic molding problem.

PRP

**when you look for plastic moldings, look first to Plastic Research Products Urbana, Ohio**

# A product of progress through integration



# FOSTARENE®

A VIRGIN POLYSTYRENE

Fostarene is a virgin polystyrene, a product of Foster Grant's new styrene monomer and polymerization plants.

**MADE BY A MOLDER DEDICATED TO THE FUTURE OF POLYSTYRENE!**

Foster Grant uses Fostarene in its own molding machines... reassuring proof of its uniform quality. Fostarene is available in pellets and granules.

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*Investigate All The Advantages of Plastoleins®*

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## *The Most Versatile* LOW-TEMPERATURE *Plasticizers Available*

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- ***Excellent Heat & Light Stability***
- ***High Plasticizing Efficiency***
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Plastoleins 9058 DOZ (di-2-ethylhexyl azelate) and 9057 DIOZ (di-iso-octyl azelate) possess all the properties of a basic plasticizer and...in addition, offer all the advantages of low-temperature flexibility.

This balanced combination of important properties has led to its extensive use in all types of vinyl compounds including calendered and cast films, calendered sheeting, calendered and dispersion coated fabrics, and all types of extruded products.

Why not give your product better performance and extra sales-appeal by using DOZ or DIOZ. Write to Dept. F8 today for descriptive literature and samples of Plastolein 9058 DOZ (di-2-ethylhexyl azelate) or Plastolein 9057 DIOZ (di-iso-octyl azelate).

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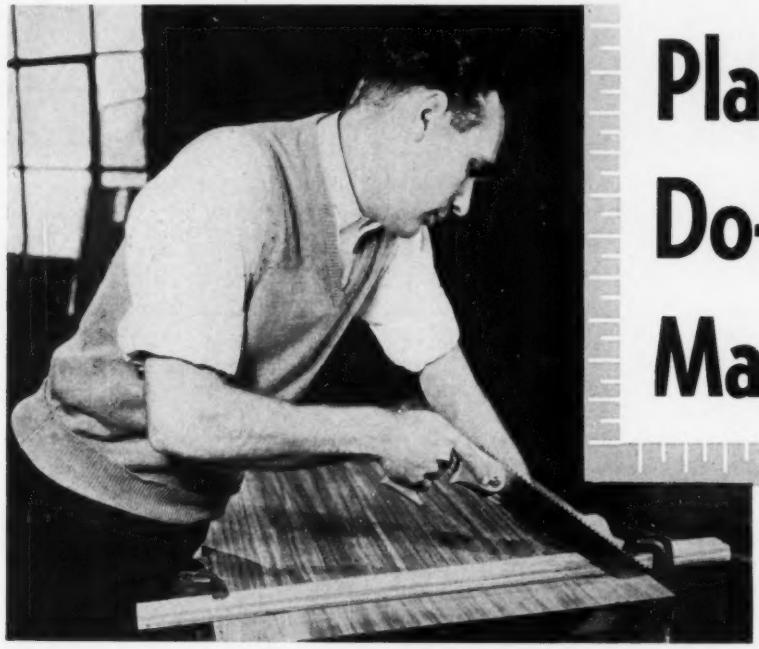
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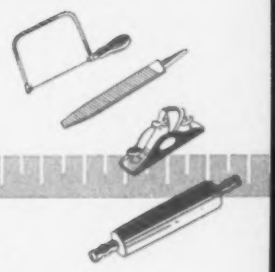
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MODERN PLASTICS

AUGUST 1954 VOLUME 31 NUMBER 12

# Plastics in the Do-It-Yourself Market





Courtesy General Electric Co.
**Easy-to-cut, easy-to-apply decorative plastics laminates lead the growing parade of plastics products sold to home craftsmen**

## Smart merchandising aids that promote the advantages of plastics help manufacturers to capitalize upon a fast-growing market

MORE and more producers of plastics products are awakening to the tremendous volume potential of the "do-it-yourself" market. With increased emphasis on shorter hours of employment, more leisure time, and the steady trend to a higher standard of living, the Saturday-afternoon mechanic is really coming into his own. And he is turning increasingly to plastics to obtain the kind of results that will please both the missus and himself without making it too rough on the budget.

### Facts and Figures

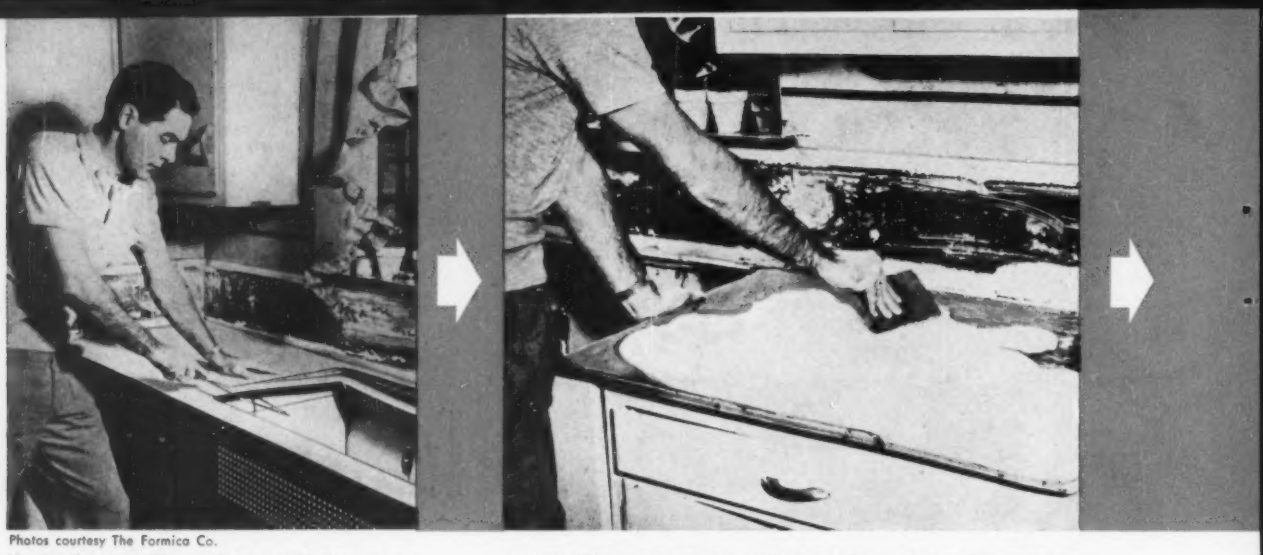
No one knows just how big the do-it-yourself market is, or just how much bigger it may be expected to become. There are, however, some significant figures which have been assembled in an attempt to evaluate this new phenomenon.

The U.S. Bureau of Labor Statistics estimates that 30% of building supplies are sold to the do-it-yourself market. Pointing to the fact that 54% of the nation's 44 million homes are occupied by their owners, Monsanto Chemical Co. estimates that this could mean about 23 million week-end decorators as prime prospects for some $6½ billion worth of do-it-yourself materials.

The expansion in sales of power tools and paints also dramatically illustrates the rise of the home handyman to a position of importance in the field of home building and remodeling. According to *Electrical Merchandising*, one industry source believes that sales of portable tools, which in 1947 stood at a modest $6,000,000, had risen to $80,000,000 in the home market alone in 1952. As an example of the tremendous possibilities which exist for power tool sales, the magazine *Sales Management* estimates that there is a home workshop existing today in every fourth home in the nation.

J. Harold Kolseth, vice president of Devoe & Raynolds Co., points out that since the end of World War II, paint has become a consumer product. Before the war, most of the work was done by professional painters, whereas now home owners themselves are doing 85% of the interior painting and 60 to 65% of the exterior work. It is a well known fact that the development of styrene emulsion base type paints has played a major role in the growth of the paint-it-yourself movement.

Because the plastics industry is so diversified and is able to meet so



Photos courtesy The Formica Co.

**Homecrafter installing a laminate kitchen counter cuts opening for sink in sheet with coping saw . . .**

**. . . Fast-setting, contact-pressure adhesive is then spread with a special saw-tooth applicator on the surface to be covered and left to dry for an hour . . .**

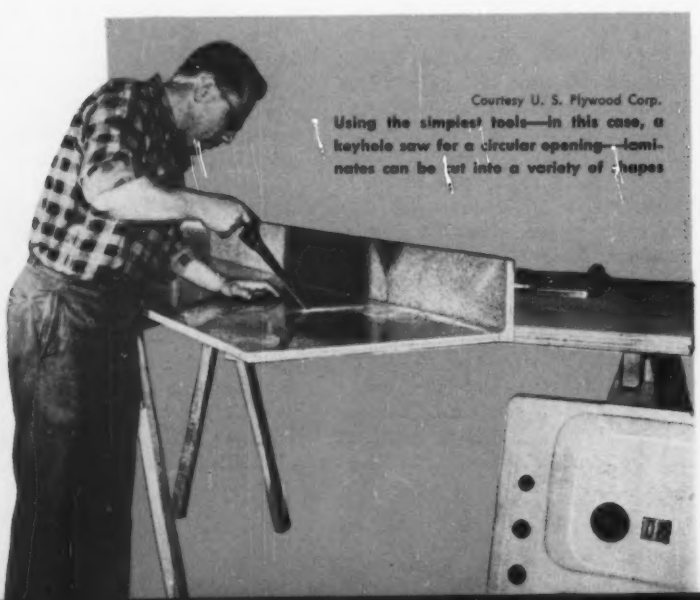
many needs of the fabulous do-it-yourself market on many different levels, this survey will necessarily only be able to touch upon a few of the highlights and current trends.

The features of plastics materials which have made them favorites with do-it-yourselfers might be summarized in a single statement: plastics make it possible to achieve professional results with amateur effort. With built-in color and finish, combined with ease of application, modern plastics materials make it possible for even the relatively unskilled worker to get good results.

Decorative laminates provide one of the most convincing illustrations of how effectively plastics are moving into the do-it-yourself field. For a number of years, these materials were limited almost entirely to professional type applications and were not available through retail outlets. Recently, however, many producers of laminates—including both the melamine and polyester type—have realized the sales potentials awaiting them in this field and are making special efforts to cultivate it.

## Contact Adhesives

The introduction of new type contact adhesives, requiring little or no pressure in the form of clamps or other mechanical means to obtain a sound, permanent bond of the laminate to the base material, has been a major factor in this development. With many of these adhesives, the serviceable decorative surface is ready for use as soon as the plastic and the base material have been brought together.



Courtesy U. S. Plywood Corp.

**Using the simplest tools—in this case, a keyhole saw for a circular opening—laminates can be cut into a variety of shapes**

Another important factor in making the decorative laminates available to the home handyman has been the development of thicker laminates which may be more easily handled in the unsupported state without risk of damage, and the introduction of some types of laminates—primarily of the polyester variety—which are sufficiently flexible that they may be rolled up and carried home under the arm.

Along with such technical advancements has come broader distribution of the laminates. Today, the materials are widely available in paint and wallpaper stores, lumber yards, department stores, and many other retail outlets. Store displays, sample patterns, and attractive literature help to familiarize do-it-yourselfers with the properties of the laminates.

## Marketing Efforts

Panelyte Div., St. Regis Paper Co., New York, N.Y. in 1953 introduced a new 1/10 in. thick form of Panelyte specially designed for the amateur market This material may be used not only on such items as dinette tables and sink tops, but also for kitchen and bathroom walls. A comprehensive package of sales aids for the new sheets was made available without charge to all dealers. The sales tools in this package included a "do-it-yourself" booklet of detailed instructions for application of the laminate, samples, advertising mats, streamers, decals, envelope stuffers, and many other forms of merchandising aids. Actual demon-



. . . When the adhesive is sufficiently dry, the decorative laminate is carefully laid on top of the adhesive-covered work surface, aligned in position, . . .

. . . and pressed down with a rolling pin. The entire job can be completed in a single afternoon at a moderate cost

strations at such events as the New York Do-It-Yourself Show, pointed up the ease with which the material may be applied.

General Electric Co., Pittsfield, Mass., another major producer of melamine type laminate (Textolite), also recently announced the availability of new pressure-contact adhesives. According to William L. Rodich, general manager of the GE Laminated and Insulating Products Dept., Chemical Div., with the new adhesives, the laminates may be readily applied and bonded to base materials using only a linoleum roller or its equivalent.

As a pioneer manufacturer of the high-pressure melamine-type laminates, The Formica Co., Cincinnati, Ohio, has taken an active interest in the growing do-it-yourself market. About a year ago, when Formica Contact Bond cement was ready for the market the company supplied a large volume of publicity releases and pictures to logical trade papers and consumer magazines.

In addition, a giant promotional broadside was mailed to some 30,000 building supply dealers, lumber yards, paint stores, and related outlets, followed by a comprehensive "Do It Yourself" merchandising kit.

Throughout the promotional program, emphasis was laid on the long established reputation of "Beauty Bonded Formica" and the manner in which its standing could be capitalized upon in developing this new market. To carry the product identity all the way through to the ultimate user, the Formica name is imprinted directly on the laminate in a type of ink which can be washed off easily.

As part of a broad new merchandising program slanted at the do-it-yourself field, United States Plywood Corp., New York, N.Y., recently introduced the Unitop, a kitchen countertop consisting of a one-piece work surface and backsplash. Water-tight and easy to clean, the Unitop is surfaced with a 1/16-in. Westinghouse Micarta melamine laminate, in a choice of three patterns and assorted colors, bonded to a 3/4-in. Weldwood plywood core. It has a 6 1/4 in. high backsplash, a deck width of 25 in., and is offered in 60-, 72-, and 96-in. lengths. A corner section, left and right interchangeable, has standard deck width and is 25 in. long. Economical in cost, the Unitop is so engineered that it

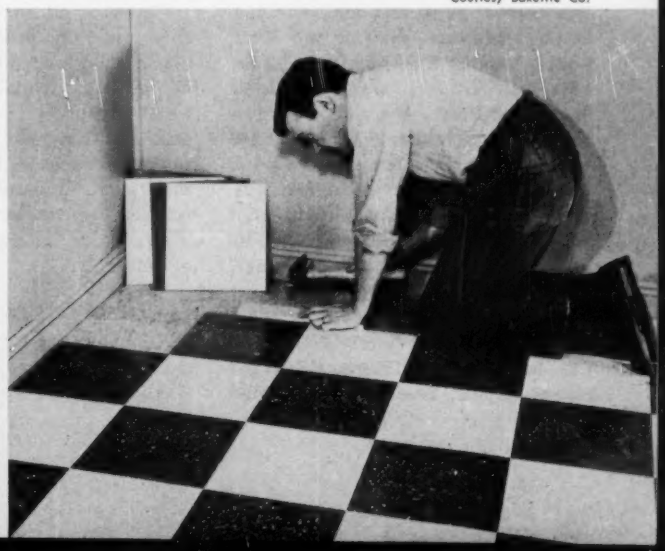
**Vinyl tile resists wear, moisture, oils, and greases. Using only an adhesive, complete floor can be laid in a matter of hours**

Courtesy The Goodyear Tire & Rubber Co.



**Vinyl tile that needs no adhesive is also available to handymen. Air pockets on underside of tile create suction that holds squares in place**

Courtesy Bakelite Co.






Courtesy St. Regis Paper Co., Panelyte Div.
**Smart merchandising designed to promote the advantages of plastics to the amateur handyman includes demonstrations at "Do-It-Yourself" shows of ease of laminate installation**



Courtesy Continental Can Co., Inc.
**Booth set up at trade show provides for demonstration to retailers of proper procedure for installing laminates**



Courtesy General Electric Co.
**Retailer also contributes to promotion of plastics laminates by prominently displaying all the materials—plastics surfacing, adhesive, plywood, and legs—needed for making a coffee table at home in a few hours' time**

can be installed by the home craftsman in an afternoon, using only simple tools.

U. S. Plywood has also introduced Weldwood contact cement, a water resistant liquid adhesive which bonds permanently on contact. In addition to its use for wall paneling, this cement is recommended to the home craftsman desiring to bond plastic laminates to furniture, home bars, or kitchen work surfaces. Weldwood Presto-Set glue, a ready-to-use adhesive named for its fast setting properties, is another useful tool for the home handyman. A white polyvinyl glue, it permanently bonds wood, hardboard, cloth, leather, and paper in any combination and is also useful for repairing porcelain objects.

Consoweld 10 melamine laminate just announced by Consoweld, Wisconsin Rapids, Wis., represents another major producer's bid for the do-it-yourself market. It is impervious to moisture, boiling water, fruit juices, and alcohol, and is easily wiped clean with a damp cloth. It comes in convenient panel sizes and in a wide range of colors and patterns, including wood grains.

National Plastic Products Co., Odenton, Md., producers of Nevamar high-pressure laminate, has announced the availability of the material in sheets at building supply dealers. This new distribution arrangement enables the home handyman to modernize and build furniture or remodel rooms in harmonizing or matching wood grains or colors.

## Polyester Laminates

Polyester type decorative laminates are also involved in the new emphasis on the do-it-yourself market. A typical producer in this new field is Continental Can Co., Cambridge, Ohio, whose Conolite Dept. produces the Conolite polyester laminates. Unharmed by boiling water, fruit acids, greases, or alcohol, this material has high resistance to scratching, chipping, and marring. It offers years of trouble-free service as a covering for walls and work surfaces.

For the Saturday afternoon mechanic, an interesting feature of this laminate is the fact that it is made in continuous lengths in 24-, 30- and 34-in. widths, and can be cut off to any desired length when purchased.

Conolite is now being retailed on a nation-wide basis through lumber outlets, hardware and department stores, and floor covering dealers. In promoting the material for the do-it-yourself field, Continental Can, in addition to various sales aids and

literature, makes use of a traveling display booth which visits plants, leading department stores, conventions, and trade events, demonstrating how to score, break, cement, trim, and apply the material with simple tools.

Even mistakes made in using Conolite can be corrected without posing too serious a problem. If the homecrafter wishes to remove a sheet of the material from a surface in order to line it up properly, he simply squirts Roltite solvent from a clean oil can directly into the cement line and peels the laminate back as far as necessary. After permitting the solvent to dry, he then re-applies the cement and proceeds with the bonding process in the usual manner. An unbonded area may be heated with a heat lamp to a temperature of about 130° F. This relaxes the laminate and reactivates the cement film, after which the repaired area may be rolled until cool.



Courtesy Monsanto Chemical Co.

**Application of styrene wall tile is made easier for do-it-yourselfer by kit containing, besides tile, mastic, grouting cement, saw, chalk and line, and spreader**

## Pre-Cemented

A new high in ease of installation, particularly helpful to do-it-yourselfers, has been attained in Satusply, a polyester type laminate produced by U. S. Rubber Co., Chicago, Ill. Supplied in continuous lengths and sufficiently flexible to be rolled, Satusply is made with a pre-cemented backing which is dry until activated by means of a solvent sold in conjunction with the material. Following activation, the cement becomes tacky and can be bonded securely to suitable horizontal or vertical surfaces with little pressure.

Lamidall, a polyester laminate produced by Woodall Industries, Inc., Detroit, Mich., comes to the customer already bonded to tempered hardboard. Sold through lumber yards and building supply dealers, the material may be easily sawed, drilled, and otherwise prepared for attachment to horizontal or vertical surfaces. Special types of metal extrusions are available which may be nailed to the wall so that the Lamidall panels can be slipped into a groove for a secure installation.

**Do-it-yourself installation of attractive vinyl sheeting on kitchen work surfaces is easily accomplished by simply pressing sheet onto adhesive-covered surface (inset)**

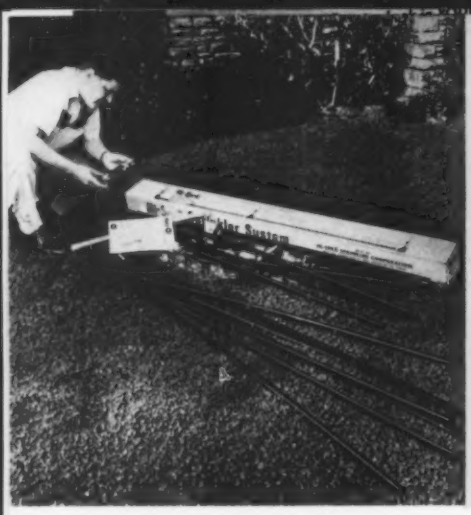
Courtesy The Goodyear Tire & Rubber Co.



## Vinyl Sheeting

Although its potentialities as a counter surfacing material for the do-it-yourself market have not yet been fully exploited, heavy gage vinyl sheeting has a number of interesting properties which make it particularly suitable for this type of installation and may be expected to find increasing use as home mechanics become more familiar with it. This material is especially useful when it is desired to provide a type of surface combining integral color, water and stain resistance, and sufficient resilience to quiet the clatter of dishes, glassware, etc., while protecting them against breakage.

Although plywood is not customarily considered a plastic material, this versatile product is bonded together with phenolic resins and thus constitutes an important market for plastics. A favorite material for the home handyman, plywood is now being supplemented by various specialized products in which wood and phenolic resins are teamed up to produce entirely new types of con-



Courtesy Hi-Spra Corp.

**Sprinkler system kit (left) contains all necessary parts—including butyrate pipe and fittings, metal valves, etc.—for assembling unit on the lawn (right). Because system is then put underground, corrosion resistance properties of butyrate have special appeal to home owner**




struction materials having unique decorative and functional properties. U. S. Plywood's Novoply, consisting of resin-bonded wood chips made in the form of sturdy decorative panels, is but one example of these new materials. Bonded granulated wood products, such as Resinwood (Rock Island Millwork Co., Rock Island, Ill.) are finding increasing use by amateur craftsmen, who like their smooth surface, freedom from knots and checking, easy workability, and resistance to warpage.

## Floor Tile

Any home handyman who has worked with asphalt floor tile knows that the material requires considerable care in cutting and fitting. With the advent of vinyl floor tile (some of which consists of a blending of vinyl and other materials, such as asphalt), many of the problems formerly associated with do-it-yourself floor installations have been eliminated. These materials, notable for their durability, are easily kept clean and do not require waxing. Their remarkable resistance to staining makes them ideally suited to kitchens, rumpus rooms, and other locations. Also in their favor is the fact that the vinyl tiles may be easily cut, when necessary, with a pair of scissors or a linoleum knife, and are so flexible that they conform closely to the floor surface, even when it is not perfectly flat.

The time saving afforded the amateur home craftsman by vinyl floor tile is a point loaded with sales appeal. Recognizing the new market opportunities for its vinyl tile presented by the do-it-yourselfer, The Goodyear Tire & Rubber Co., Akron, Ohio has brought out its Flor-Master installation kit, which provides the simple tools needed to do a professional job. Included in the kit, available with the tile from flooring dealers, are a flooring knife, trowel, string or line, chalk, and roller. Goodyear vinyl adhesive, available in quart, gallon, and 5-gallon cans, is customarily used in installing the tile. A colorful instruction folder supplied by the manufacturer includes a chart for working out a pattern using the various color tiles available and step-by-step directions for installation.

Mastic Tile Corp. of America, Newburgh, N.Y. producers of Matico Aristoflex vinyl-plastic tile flooring, offers prospective users of the product a free install-it-yourself instruction kit and color chart to stimulate interest in the product. Retail ads point out that the tile never needs scrubbing, that acids and alkalies wipe up immediately without a trace, that it lasts for years, and that it "can be installed in every room from basement to attic."



Courtesy Forrest Process & Development Corp.

**Making use of variety of deeply textured patterns available in vinyl fabrics (above), the housewife can do her own upholstery or cut out her own doilies, place mats, etc. (left)**

Courtesy B. F. Goodrich Chemical Co.

## No-Cement Tile

Even the do-it-yourselfer who wants to get entirely away from a cementing operation can do just that —thanks to a unique new type of vinyl tile developed by Robbins Floor Products, Inc., Tuscumbia, Ala. Available in 9 by 9 or 12 by

12 in. sizes, in a choice of 16 colors and "terrazzo," Lifetime Terra-Tile owes its non-curling properties to its "stress-relieved" construction. Stresses locked into the vinyl material during the calendering operation are later eliminated by chopping the sheets into small pieces and fusing them into the finished tiles, which are a full ¼ in. thick. On the underside of each tile is a waffle-like grid made up of 400 deeply cut square pockets, while parallel ridges line all four edges.

This tile is applied without adhesive directly to wood, concrete, or other floor surfaces. The tiles are held securely in place by lateral compression, produced by squeezing them tightly together as they are laid and by the vacuum-cup effect of the small air pockets. When the final row of tile is laid, extra compression is obtained by means of a block of wood and a hammer, so that the tiles literally have no place to go. If it becomes necessary to replace worn individual tiles, or even to lift up the entire job, the tiles may be readily removed by means of a vacuum cup attached to the end of a short handle.

## Wall Tile

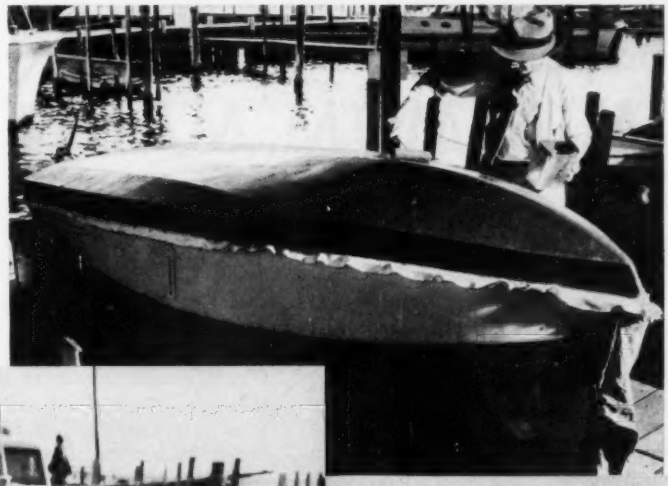
In recent years, more and more apartment and home dwellers have discovered how economically and easily they could improve the appearance of kitchens and bathrooms by installing their own plastic wall tile. The most frequently used type

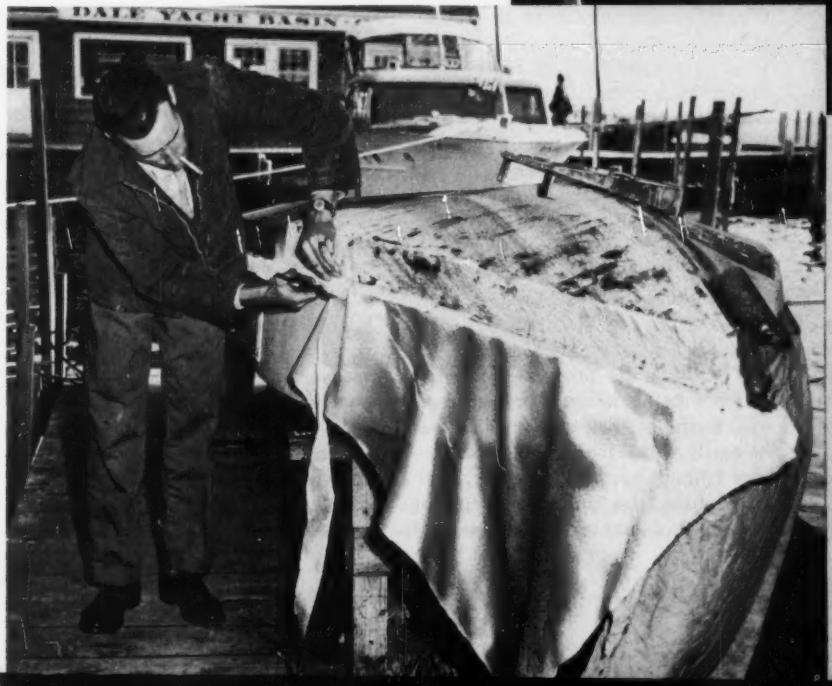
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Courtesy Pan Laminates, Inc.

**Translucence and texture of rigid vinyl laminates with locked-in yarns, leaves, etc., are put to use by the amateur decorator in building partitions or room dividers**





Photos courtesy Owens-Corning Fiberglas Corp.

**Simple application of liquid polyester resin and fibrous glass cloth to wooden boat hull provides both effective protection and an attractive appearance**

**After a primary coat of resin has been spread on the wooden hull, the fibrous glass cloth is laid up and trimmed. A second coat of resin—and possibly a third—is then applied over the cloth**



Courtesy Checker Cab Mfg. Corp.

# MINIMUM MAINTENANCE FOR

WITHIN the space of a few months, a taxicab may be subjected to as much punishment as the ordinary passenger car undergoes during several years of service. The interior of the cab, in particular, is a principal object of abuse by the hundreds of passengers who use the cab each week.

To keep the cab in serviceable condition at all times, therefore, it is necesssary to design the interior appointments of the vehicle so that they are easy to clean, will stand up under rough usage, and will not require frequent replacement.

For the Checker Cab Mfg. Corp., Kalamazoo, Mich., vinyl materials have provided an effective solution to the problem. According to Morris Markin, president of the organization, the incorporation of vinyl upholstery and vinyl covered door panels in the new Checker cab models has considerably lengthened the service life of the interiors—in most cases, to match the service life of the cab itself.

The door panels for the new Checker cabs consist of a decorative hard vinyl sheet material applied to a backing of 80-point fibreboard by means of a combination bonding and forming operation. Particularly noteworthy in the use of this fabricating technique, in addition to the attractive appearance and performance of the finished panels, is the excellent bond obtained between the rigid vinyl sheeting and the fibreboard.

The rigid sheeting is tough and has excellent resistance to abrasion and scuffing. Its properties prevent it from being affected by greases, oils, foods, or dirt, all of which can be easily wiped from the plastic surface without harm to the door panel. In addition, the integral coloring of the vinyl sheet, unlike the printed or painted surfaces of other door panels, cannot be rubbed or peeled off. The use of vinyl surfaced door panels also eliminates the problems of wetting, warping, delamination, and tearing—common failings in cardboard or coated fabric panels.

## Formed Sheet

For the production of the door panels, the company doing the actual fabrication of the units is supplied with three types of rigid vinyl sheeting—grey sheeting, 0.010 in. thick, 32¾ in. wide, and embossed with a simulated Shantung finish; brown sheeting, in the same thickness and similarly embossed, but measuring 37 in. wide; and blue sheeting, also 0.010 in. thick and embossed with the Shantung finish. Color combinations of grey and brown sheeting and grey and blue sheeting are used by the fabricator in making the finished panels.

The specially developed formulation used for the rigid polyvinyl chloride sheets contains no plasticizer. Although rigid and firm at room temperatures, the sheet can be easily formed at elevated temperatures into a variety of shapes without losing its embossed grain finish.

In the manufacture of the finished panels, the embossed rigid vinyl sheeting is first laminated to the asphalt fibreboard base, then hot formed to shape. Vertical and horizontal ribs formed into the panels provide increased strength and add interesting design detail.

## Laminating Technique

In bonding the vinyl material to the fibreboard base, the principal problem is to obtain satisfactory adhesion between the two materials. To achieve this, a cut-back type of heat-activated rubber adhesive is used. During the laminating operation, all solvent must be removed to eliminate any possibility of blistering in the panels. Each panel section is die cut and assembled by the fabricator to the sheet of fibreboard which forms the back of the finished panel.

The laminating and forming operation is performed on a combination steel rule embossing die with a mechanical embossing press, using a temperature of approximately 200° F. and a pressure of around 200 p.s.i. At this temperature, the fibreboard, as well as the vinyl sheeting, becomes pliable and capable of being formed.

After the forming operation, decorative metal trim strips are applied to the face of the panel at the points where the different color sheetings meet, and a flexible vinyl binding is stitched in place around the edge of the panel.

## Upholstery

The upholstery material used in the new cabs is a vinyl chloride coated fabric that is applied not only to the seats and backs but also to the roof interior and the seat end panels. The fabric backing is a napped broken twill material and the vinyl coating is embossed with a simulated tweed finish. The fabric is made in grey, brown, and blue colors to harmonize with the colors of the door panels.

In addition to the strength of the material, outstanding resistance to soiling is one of its major advantages. The pattern and surface finish used do not easily retain dirt or stains and, like the door panels, are easy to keep clean.

From the standpoint of the passenger, the grained surface of the upholstery minimizes the likelihood of slipping out of the seat in the event of sudden stops—a frequent source of injury claims. Cab companies have found that such accidents are more likely to occur when cabs are upholstered with smooth materials that have little or no resistance to sliding.

CREDITS: Door panels fabricated by Woodall Industries, Inc., Detroit, Mich., using Koroseal rigid vinyl chloride sheeting supplied by The B. F. Goodrich Co., Marietta, Ohio. Fabrilite vinyl coated fabric upholstery and interior trim materials supplied by E. I. du Pont de Nemours & Co., Inc.

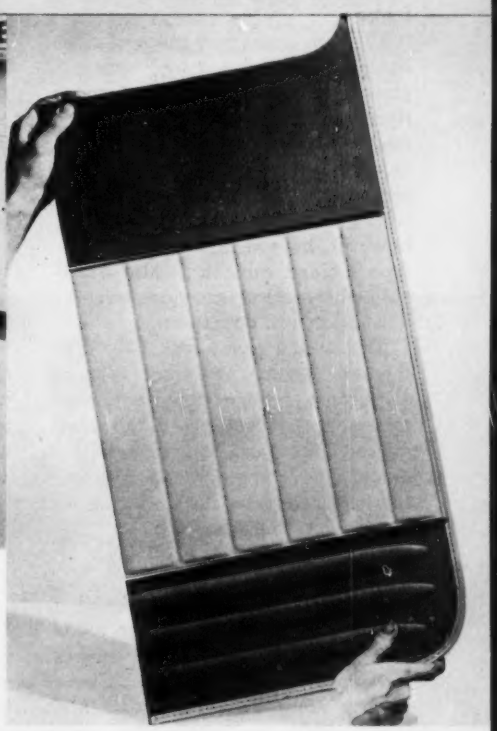
# CAB INTERIORS

**Vinyl-surfaced door panels and vinyl coated upholstery fabric complement cab furnishings**



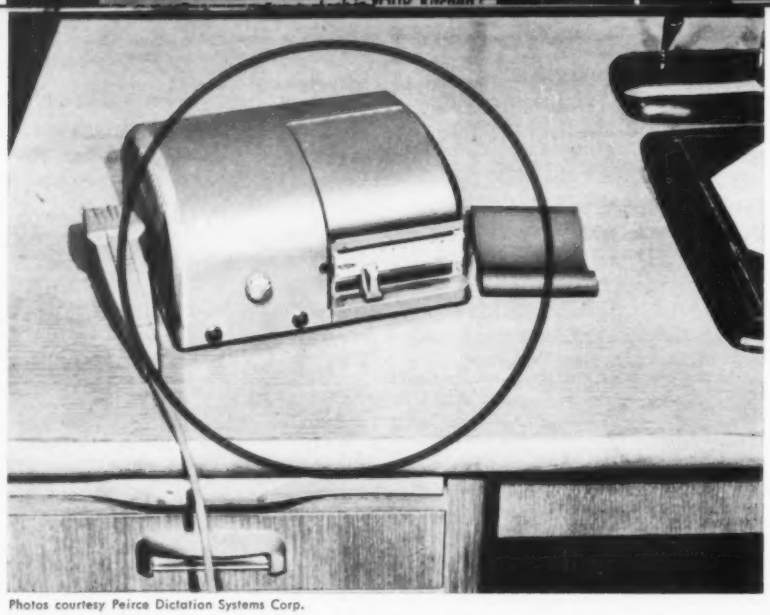

Courtesy The B. F. Goodrich Co.

**Durable, attractive, and scuff-resistant inner door panel for taxicab, fabricated of vinyl sheeting laminated to an asphalt fibreboard base, is easily installed**



**Close-up of part of a two-tone door panel, with the different colors separated by metal trim moldings. The decorative and reinforcing ridges are heat-formed. Stitching which holds sheet vinyl edge binding in place goes through fibreboard base**

# Plastics



Photos courtesy Peirce Dictation Systems Corp.

**Tough, reusable polyester belt (to right of machine) holds up to 15 min. of dictation**

**Ventilating grilles and openings to accommodate power cord and microphone are molded into main phenolic housing**



THE most comprehensive use of plastics yet recorded in the dictating machine field is found in a new unit recently placed on the market by Peirce Dictation Systems Corp., Chicago, Ill. In addition to being one of the first magnetic recording units to employ coated Mylar polyester film as the recording medium, this machine is housed in a case molded of phenolic and incorporates a molded phenolic recording drum as a basic operational feature.

This handsome new piece of office equipment, developed by Peirce engineers in cooperation with Armour Research Foundation, under whose magnetic recording patents the machine is licensed, can be used as a combination dictator and transcriber. A separate transcriber, however, housed in the same basic-type molded cabinet, is also available where office procedure calls for a separation of operations.

Among the many advantages of the new system are elimination of all surface and operating noise, centralization of controls in the hand microphone, and provisions for quick, easy correction while dictating and automatic back spacing on the transcribing operation.

## Magnetic Belt

Instead of the conventional cellulose acetate tape with an iron oxide coating, the Peirce machine makes use of a polyester film belt or sleeve slightly more than 4 in. wide and about 4 in. in diameter. Since previously recorded material is automatically "erased" from the belt when new dictation is fed into the machine, the belt, which holds up to 15 minutes of recording, can be reused an unlimited number of times. The conveniently-sized, lightweight belt also simplifies the problem of mailing or filing.

Peirce fabricates the belts from 0.0015 in. thick Mylar film coated with a 0.0007 in. thick layer of iron oxide which serves as the actual magnetic recording medium. The two ends of the belt are brought together in a butt joint and held in place by a low-cold flow-type splicing tape applied from the back.

The principal advantages of polyester film for this application are outstanding tensile strength and excellent dimensional stability despite changes in temperature and humidity. Since the recording "tracks" that spiral around the belt in the course of dictation are very close together, this dimensional stability helps to insure against interference between adjacent, although invisible, lines on the belt.

## Economical Finish

The entire housing for the Peirce dictating unit is molded of black phenolic material and the parts are later given a low-temperature baked enamel finish in a pleasing gray color that harmonizes with modern office decor. In the near future, however, the company plans to mold many of the housings in urea, in a range of selected colors, thereby eliminating all supplementary finishing operations.

In addition to the basic case for the machine, the principal phenolic parts include the cover, case side, front plate, front block, and the two parts which are assembled to form the belt cylinder. The total weight of these parts is just over 42 oz., with the main housing component accounting for 23 ounces.

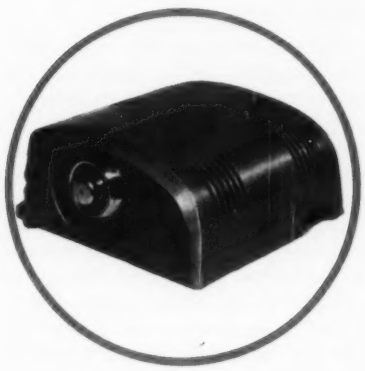
Why did Peirce designers and engineers specify molded plastics for the various parts of the dictating unit? In designing the belt cylinder, there were certain technical problems involved which favored the use of a non-metallic drum. As for the case itself, Emil C. Steinbach, chief engineer and in charge of production for Peirce, explains that elimination of costly surface finishing was an important factor in the selection of plastics as the construction material. Had the case been made of cast or formed metal, painting or some other type of expensive finishing operation would have been required to obtain the desired color. Since future plans of the company call for the units to be offered in a choice of colors, this would have in-

# for Dictators

**Polyester film is used as the recording medium in new dictating machine having a number of phenolic components**

volved a complicated finishing set-up to color-match cases, covers, side covers, and other exterior parts of the machine. With molded plastics, however, the same set of tools can be used to turn out all of the components of the case in any desired hue, and no further finishing operations would be required. Parts can move directly from the custom molding plant to Peirce ready for final assembly.

A molded plastic case also simplified the problem of insulating the various electrical components, since plastics are inherently excellent insulators. The possibility of short circuiting through contact with the outer case is thus automatically eliminated. In addition, molded thermosetting parts have good acoustical insulating characteristics and are lighter in weight than comparable housings of metal.



Courtesy Peirce Dictation Systems Corp.

**Edges of hinged cover (left) are machined for snug fit with main housing**

## Phenolic Housing

The main housing, largest of the plastic parts, is compression molded on a 200-ton press, with the phenolic material being preformed and electronically preheated to expedite flow of the plastic and shorten the molding cycle. This housing includes five internally threaded inserts along the bottom edge, which are used in fastening the housing to the metal base plate of the machine, and two smaller inserts in the top section to which the cover mounting hinge is attached. Two sets of vertical louver slots are molded in the back of the case and a larger single louver in the left side. These openings provide ventilation for the vacuum tubes and other electronic components of the machine.

The cover of the case, hinged in position so that it may be swung open to afford access to the belt drum, is transfer molded of black phenolic material. Two small internally threaded inserts provide a rigid mounting for the piano-type hinge. Gated near the center on the inside surface, this part is designed with a heavy, rounded front edge that conforms with the curved contours of the rest of the case. At the point, where the cover snaps shut against the case, the piece has a pronounced undercut formed by a removable plate in the mold.

The cover, after removal from the press, cools on a shrink block and then is ground to a reverse draft along the left edge. Since the cover and the case must fit closely together, this edge must be ground down so that the two parts can mate properly.

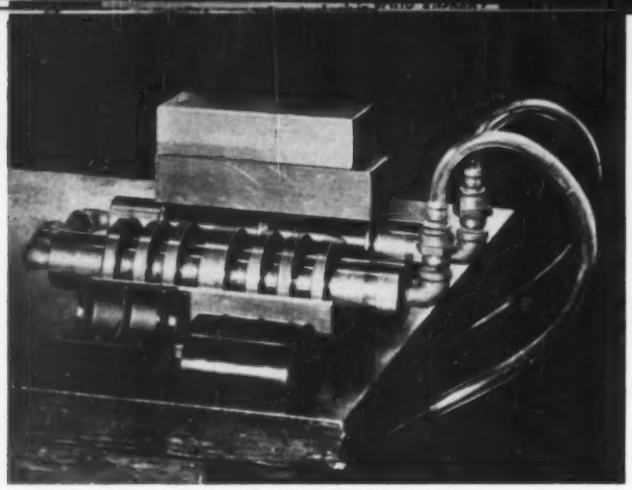
## Three Phenolic Parts

A family mold, running in a 200-ton compression press, produces the three remaining components of the housing—the case side, front plate, and front block. The phenolic material is preformed and electronically preheated prior to molding, and again fixtures are employed to insure dimensional accuracy of the parts. The front block, a narrow piece, is molded with two female inserts used in attaching the block to the metal base. The front plate, which mates with the block, has a long, narrow slot at the bottom edge in which the indicator knob control moves horizontally during operation of the machine. Three rectangular openings and several cored holes are molded into the plate to facilitate assembly to the case and to provide for the mounting of the metal holder for the indicator card.

The case side, with its half-moon shaped opening, contains the heaviest sections of any of the molded parts—it measures approximately ¼ in. thick on the sidewalls and has a



**Major plastics components—all molded of phenolic—include: (left to right and top to bottom) main housing; assembled belt cylinder; front plate; cover; disassembled cylinder; front block; and case side. Small parts (foreground) include phenolic sound head blocks and control knob and butyrate carriage and marking knob**





Disk-like flanges of shrink fixture prevent the two halves of belt cylinder from warping

Cold water circulates through fixture while halves are held in place with steel blocks

maximum wall thickness along the bottom and back edge of about 1 inch. Two openings are cored in the bottom of this part for assembly purposes.

## Belt Cylinder

From the production standpoint, the most critical of the molded phenolic parts for the new Peirce magnetic dictation machine is the belt cylinder. The two identical halves that make up this part are molded in a 2-cavity die on a straight compression press.

The molding problems involved in the production of this part arise from the close tolerances required in dimensions, the differential shrinkage across the length and width of the parts, and the fact that each half of the unit must be molded slightly out of round in order that the two halves be able to form a perfect cylinder when their edges are separated by approximately 3/16 inch. This design is dictated by the fact that the two halves must be squeezed together slightly so that the Mylar magnetic belt can be readily placed on or removed from the drum. Because of an internal spring action, the drum opens slightly when pressure is released, providing a snug fit between drum and belt. Thin rubber sheeting cemented to each half of the drum prevents belt slippage and provides a resilient surface for the recording head to bear against.

To insure proper operation of the drum, a rigid dimensional tolerance of ±0.005 in. must be maintained across the arc of the cylinder halves and the edges must be absolutely parallel. Three deep internal ribs in each part help to maintain accurate alignment. Slots across the ends of all three ribs on one side and across the other end of the center rib accommodate the internal metal rod and bar used in assembling the two halves. The parts are molded end-to-end with only a thin layer of flash between them.

To maintain the rigid dimensional specifications required of the cylinder halves, the molder developed metal cooling fixture. Actually a double fixture, it simultaneously accommodates two complete sets of cylinder halves so that each set can be left in the fixture through two molding cycles. Upon removal from the press, the parts are separated and placed, open side downward, in the fixture, so that the disk-like flanges extending from the central stem of this turned metal part bear directly against the inner surface of the cylinder shells. Heavy steel blocks with machined semi-circular longitudinal grooves are then laid on top of the molded parts and an extra block placed over these for added weight. Cold tap water from the plant supply system, circulating continuously through the inside of the fixture, cools the molded parts rapidly and the closely machined metal parts pressing against the inside surface of the cylinder insure against warpage.

The improved accuracy of the cylinder halves has made it possible to limit plant assembly operations to cementing-on the exterior rubber covering, drilling holes for the metal rods, and assembling the halves into finished cylinders on special fixtures.

Because of the electrical insulating properties of phenolic, the use of the material for the construction of the belt cylinder also contributes to more effective undistorted recording. The metal cylinders previously used at times produced a change in signal output as the cylinder revolved, resulting in a rise and fall of the magnetic field and consequent interference with proper functioning of the recording head.

## Other Components

Several other plastics components are involved in the design of the dictating machine. The complete microphone unit is molded of cellulose acetate butyrate, as are the finger-fitting carriage and marking knob. The knob is backed by a small metal point which perforates the record slips to index the location of individual letters and memos.

The sound head blocks, which serve as an insulator and mounting for the recording head, are molded of phenolic. Also of phenolic is the operating control knob on the front of the instrument.

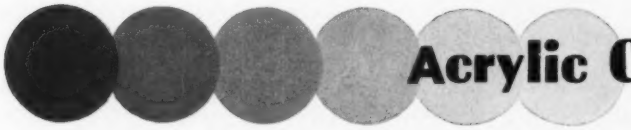
Whether in the form of minor components or as an integral major part of the system, plastics contribute much toward the handsome outward appearance and the efficient operation of the dictating unit.

CREDITS: Scotch brand magnetic film tape is supplied by Minnesota Mining & Mfg. Co., St. Paul, Minn., and is based on Mylar film from E. I. du Pont de Nemours & Co., Inc. All major phenolic case components, including belt cylinder and sound blocks, are molded by Industrial Molded Products Co., Inc., Chicago, Ill., using phenolic material supplied by Durez Plastics & Chemicals, Inc. Phenolic control knob is molded by Harry Davies Molding Co., Chicago, Ill. Butyrate microphone unit is supplied by Electro-Voice, Inc., Buchanan, Mich. Carriage and marking knob are molded by Peirce Dictation Systems Corp. on their own injection machine using Tenite II butyrate supplied by Eastman Chemical Products, Inc.

# COLOR IN PLASTICS

## Part 2 of a Symposium in Print

The first four articles in this series of fifteen appeared in our July issue. Subjects covered in the initial symposium included: the basic problems related to the use of color in plastics; the various color survey methods; color merchandising; and the selection of the proper colorants to meet specific requirements.
In the present issue, the problems involved in coloring four specific materials are presented: vinyl, polystyrene, acrylic, and polyethylene. Each article has been prepared by experts in each particular field covered.
This important series on color techniques and problems will continue through the next two issues of MODERN PLASTICS magazine.



# Acrylic Color Techniques

by Stanton C. Kelton, Jr.

WHILE there are many similarities between the color problems of various materials, the technology of coloring the acrylics is extraordinarily varied and interesting, replete with a number of unique situations and problems. One such situation, in particular, resulting from the physical properties of the material, makes the job of the acrylic colorist both easier and more difficult than that of other plastics colorists. This article will review the nature of this situation, the technology for coloring acrylic plastics, and some of the more important acrylic applications which utilize color so effectively.

The acrylic plastics are, broadly speaking, those formulas based principally on polymers of derivatives of acrylic acid ($H_2C = CH\,COOH$). By far the most important monomer of the acrylic family is methyl methacrylate ($H_2C = C\,(CH_3)COOCH_3$). The monomer attained this position because it is the easiest and cheapest to produce in a pure state and because its polymers and derivatives have the best physical properties for use in the molding and fabrication of solid objects. The acrylic polymerizations are done in several types of bulk and emulsion processes under the influence of heat and usually catalyzed by benzoyl or related peroxides. At times, ultra-violet energy and special activators are used.

The acrylic plastics are marketed as molding powders, cast sheets, rods, tubes, and extruded shapes. All of these may have the sparkling colorlessness of the base polymer or may be intentionally colored, internally or externally, to produce an infinite variety of effects.

The superior stability and clarity of the basic colorless plastic enormously facilitate the problems of adding color to acrylics; yet, at the same time, they create difficult technical problems. While the acrylic colorist is relatively free of concern over yellowness, turbidity, opacity, chemical stability, and weather permanence in the base polymer, he faces a problem in the selection of quality colorants and methods of coloring. The most attractive applications are often those where the demand is for extraordinary weather permanence, precise color rendition, and uniformity of appearance. The coloring must be done so as to maintain the good dimensional stability, machinability, and breakage resistance characteristic of the colorless acrylics. Selection of colorants and methods of coloring are, therefore, a major problem.

### Colorants

The colorants found most useful for acrylic applications include a moderately wide variety of pigments and dyes adopted from the paint, printing, textile, and ceramic trades, with only a few items which are peculiar to the acrylics. Whites are made with zinc, barium, strontium, or titanium pigments, or incompatible polymers. Frequently, mixtures are used to get the best



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**If snow were any other color than white, it would absorb the sun's rays and melt rapidly, permitting the earth to be warmed by the sun earlier in spring, and allowing for earlier planting. Being considered now is a dye for use on snow.** Dyelines and Bylines

combination of whiteness and translucency. Translucent reds, oranges, and yellows are generally made with cadmium sulfoselenides and cadmium sulfide; occasionally, the iron oxides are useful. The B.O.N., toluidine, and other organic reds have merit in special situations, as do the Hansa yellows. The greens and blues are made with phthalocyanines, supplemented by iron blues, ultramarine, cobalt, and chromium pigments. Dyes are used for the violets. Blacks are made with either carbon black pigments or a suitable selection of two or three chromatic dyes.

With the acrylics, as with most plastics, there is no need for fixation of the colorant to the plastic. The coloring operations are primarily mixing or diffusing techniques which do not involve chemical bonding to the plastic molecules. For this reason, a "dye" can be any colored compound which is soluble in ester solvents and which is resistant to peroxides, to temperatures of at least 475° F., and to several years of solarization. These requirements have been met by only a few compounds, many of which are often anthraquinone derivatives.

Requirements for pigments also include resistance to peroxide, temperature, and solarization. Complete insolubility is desirable so that the color of the article will not change with varying processing or molding times and temperatures. The most difficult problems, however, are those inherent in attainment of the proper particle sizes. Very few applications of acrylic plastics require or permit opaque colors. The big demand is for translucent effects where the appearance depends on both the transmittance and reflection of light. Although the light source itself must often be obscured by the plastic, a maximum of lighting efficiency is required.

In such applications, the pigment particles should be uniformly 0.8 to about 4 microns in size and colorimetrically pure. The objective is to obtain the maximum hiding power through scattering and transmittance rather than through absorption or reflection phenomena. Particle size problems are even more important in the transparent formulas possible with certain pigments; these often require special techniques for dispersion and prevention of flocculation.

## Techniques

The acrylic plastics may be colored both internally and externally. The former is most important commercially in terms of volume and is usually done by the original plastic manufacturer. The latter is done to achieve special multi-color effects not possible or practical by the internal techniques.

Internal coloring of cast acrylic sheets is done by mixing the colorants uniformly into the liquid methyl methacrylate monomer containing catalyst and other modifiers. The liquid is converted to a solid plastic by heating at 40 to 80° C. from 4 to 24 hr., depending on the thickness of the sheet being cast. Obviously, the colorants must not change during this period nor should there develop settling or streaking or other non-homogeneity of color.

**To the physicist color is light and energy. To the chemist it means dyes and pigments. The artist regards it in terms of beauty. To the politician it is a semantic tool. To the psychologist color means sensation. But to everyone color is emotion.**

Internally colored rods can be made either by grinding bar stock from colored flat sheets or by casting in special molds. Tubes can be fabricated from flat sheets also, but the most interesting method is by centrifugal casting using a rapidly rotating heated cylinder. This technique is especially valuable in orienting pearl and metallic flake pigments to produce a beautiful sheen not obtainable in the conventional flat sheet process. Cylinders so produced are often cut and flattened to sheets for the button, jewelry, and accessories trades.

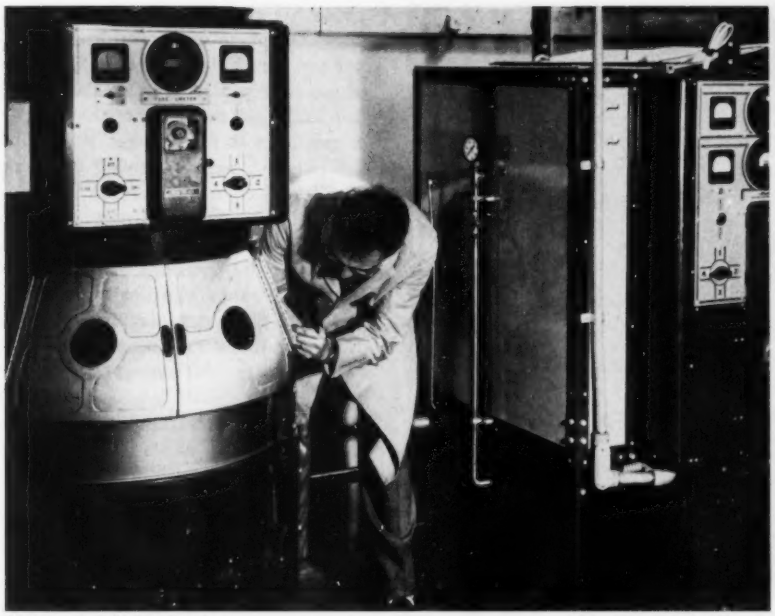
The usual molding powder process involves polymerization in the colorless form. This is followed by compounding and converting to colored pellets. The compounding may be done batch-wise or continuously on a differential-speed two-roll mill or by means of a compounder-extruder. Since the colored product must be thoroughly uniform in color and precisely on standard, the actual compounding is usually preceded by blending of the dry dye with the colorless granules using the well-known dry coloring techniques.

Dry coloring of molding powder granules is one form of external coloring. The product is important only as an intermediate and is injection molded or extruded to a useful internally colored article. If the pigments or dyes are predispersed in a lacquer or resinous paint, the dyes or pigments can be applied to sheets or articles externally and permanently. The acrylic plastics are excellent for these techniques because the base plastic is colorless, permitting true appraisal of the applied color when it is viewed not only on but through the plastic. Dip dyeing, mottling, painting, vacuum metallizing, laminating, and decals are examples of this type of coloring. The first three can be done by brushing, spraying, dipping, rolling, screening, and printing techniques. Since all can be applied to colorless or colored plastic in a semi-finished state, the variety of possible effects is virtually without limit.

The external coloring techniques have the great advantage of facilitating complicated color combinations. Perhaps the most effective and interesting applications are those in which an internally colored sheet or molded articles are externally colored to produce a combina-

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**Although statistics indicate that one out of every 15 people suffers from a degree of color-blindness, only few live in a world that is nothing but black, white and gray. To many color-blind individuals yellow appears as tan, red may appear as dark yellow.**





Photos courtesy Koppers Co., Inc.

**Equipment for testing colored formulations for lightfastness (left) and aging (right)**

**Color and color difference meter**

# Color in Styrene and its Alloys

**by T. H. Insinger, J. T. Guyol, and J. J. McGovern**

THE phenomenal growth in production and use of styrene materials within the last six years has prompted molders and commercial designers to seek new ways to make their products distinctive and more attractive. Color has been found to be one of the best ways to create the desired sales appeal.

The resulting increase in demand for new and different colors has presented a considerable problem to the styrene colorist. The days when the customers' basic needs were satisfied with the M.C.A.-N.B.S. standard colors for polystyrene—the "PSP" colors chalk white, refrigerator white, porcelain white, black, green, brown, kitchen red, maroon, baby pink, baby blue, medium blue, royal blue, yellow, crystal, and transparent red, blue, yellow, and green—are gone. During the past five years there has been such a trend toward the use of special colors that today many of them greatly exceed the so-called standard colors in sales volume.

This increase in demand for individual, unique colors, has also been accompanied by more critical standards in the application of colored styrene materials. Wall tile molders, for example, demand an extremely high degree of uniformity of color, not just within a single shipment, but for the entire length of time—often several years—during which a particular color is used. Extruders of forms for fluorescent lighting units also require exacting uniformity in both transmitted and reflected color so that damaged lighting panels may be replaced with new units that show no noticeable difference from the original installation. Appliance manufacturers emphasize that assemblies of several pieces, each perhaps molded by a different company, must have no visible color variation—even though several types of materials, such as regular, medium-, or high-impact styrene, are all incorporated in this one assembly.

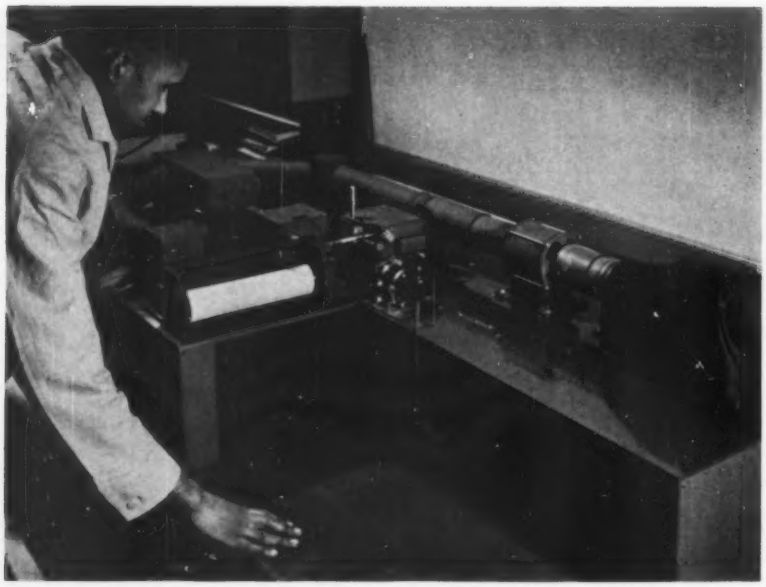
If there is one subject, then, that has demanded the utmost attention from the styrene colorist, it is the extremely critical control of color uniformity.

Incorporation of the colorants in the styrene compounds is usually done by such fairly conventional methods as extrusion, milling, or hot mixing. In some instances colorants can be added directly to the monomer prior to polymerization.

## Processing Methods

In the extrusion process, the colorants are blended, either continuously or batch-wise, with granules of the uncolored (crystal) polymer and the resulting mixture is fed to the extruder where it is compounded and the colorants permanently incorporated. Extrusion temperatures are in the 350 to 575° F. range, with the hold-up time in the machine being in the order of 2 to 10 minutes. The material is extruded as filaments or as a continuous sheet. The filaments are normally cut to produce pellets while the sheet is either used as is or slit and chopped into pellets.

In milling operations, the uncol-



Recording spectrophotometer for special transmittance and reflectance measurements

ored polymer and colorants are compounded on a hot two-roll mill or in a hot mixer such as a Bolling or Banbury mixer. Mill and mixer temperatures run in the 325 to 400° F. range, with a 4- to 12-min. cycle time. The mixture can then be cooled and granulated or fed to an extruder line for forming into pellets or sheet.

## Colorants

Development of larger molding machines and faster molding cycles has resulted in molding temperatures in working with styrene that run as high as 650° F. To allow the molder ample leeway in the production process, colorants used in the styrene compounds must, therefore, be stable—not change color, decompose, or react chemically—to at least this temperature and preferably to 750° F. or beyond for a period in excess of the molding cycle. This single requirement precludes the satisfactory use of about 99% of the common organic dyes and pigments and about 50% of the common inorganic pigments. The acceptable colorants remaining are limited to such inorganic pigments as titanium whites, cadmium reds and yellows, carbon black, chrome greens, ultramarine blues, and a few specialties such as metallic powders and tinsels, and to such organic materials as phthalocyanine and alizarine greens, anthraquinone blues and violets, and some oil-soluble dyestuffs. Light stability requirements, while not a problem with most inorganic pigments, restrict even further those organic colorants which pass the heat stability test.

In general, colorants incorporated in styrene compounds and exposed in the standard Atlas Fade-Ometer should show no appreciable fading after 120 hr. exposure. Because of the types of colors often demanded by molders, particularly the rich, brilliant colors that require the use of large amounts of organic dyes, it is not always possible to use only the colorants that pass the tests outlined above. It is an unfortunate but inescapable fact that, in a few instances, colorants have simply not been discovered that will produce a particular color, yet satisfy the heat and light stability requirements outlined above. For the well known standard baby pink, for example, the sulfanthrene pink dye needed to obtain the proper color is thermally stable only to about 450° F. and its light stability is also very poor.

## Dispersibility

Stability is not, in itself, however, the only requirement for a styrene colorant. Probably the next most critical requirement is dispersibility. A single pigment speck or streak in an 8- or 9-sq. ft. refrigerator door liner is often considered sufficient cause for rejection. Basic causes of poor dispersion in the finished product are insufficient particle fineness of the colorants used in the formulation and agglomeration of the smaller particles to form larger lumps in the polymer manufacturing process. Ideally, all colorants used in styrene compounds should pass 100% through a 325-mesh screen (i.e., 0.0017-in. sq. opening). This is the coarsest particle size desirable. Unfortunately, most colorant producers, at this time, do not manufacture products which meet these specifications.

Some manufacturers offer colorants which pass 99.8% through 325 mesh, but that residual 0.2% can cause serious difficulties. As a result, it is often necessary for the styrene compounder to further process dyes and pigments prior to use. Colloid mills, comminuting machines, and automatic screening devices are commonly used to reduce the particle size of the required colorants to a usable size.

Another problem in coloring the material is the static charge inherent in styrene. This static charge causes the pigments to agglomerate in some blending operations. Liquid wetting and dispersing agents may be used to minimize the effect of the electrical charge. Predispersing the colorants in the base stock and then grinding to form a pigment concentrate is also used successfully to solve this problem.

## Quality Control

Proper quality control of color requires exacting examination for contamination and colorant dispersion as well as visual and instrumental checks for color quality.

To exercise good control, the colorist has had to make utmost use of available instrumentation and, often, develop his own specialized instruments. Colorimeters, such as the I.D.L. color eye and the Gardner-Hunter color difference meter, and spectrophotometers, such as the Beckman and General Electric models, have found increasing use in the field of color control.

An example of how colorimetric data may be used in color control and formulation adjustment is indicated as follows. The problem at hand was to control the color during production of a green styrene equivalent to PSP-16. The first con-

trol check taken showed the following situation:

*I.C.I. COLORIMETRIC DATA*

| | X | Y | Y |
|---|---|---|---|
| Standard specimen | 2242 | 5062 | 1923 |
| First control check | 2220 | 5025 | 1909 |

This indicated that while the product is a fairly close match for the standard specimen, it has a tendency to drift toward the blue and pure side. Based on reference data and experience, a formulation adjustment was made:

*COMPOSITION, WT. %*

| *Component* | *First Formulation %* | *Adjusted Formulation %* |
|---|---|---|
| Phthalocyanine green | 0.022 | 0.020 |
| Cadmium primrose | 0.146 | 0.150 |
| Titanium dioxide | 0.040 | 0.040 |
| Styrene polymer | 99.792 | 99.790 |

After this formulation adjustment has been made in the production line, a second control check was taken.

*I.C.I. COLORIMETRIC DATA*

| | X | Y | Y |
|---|---|---|---|
| Second Control check | 2238 | 5055 | 1920 |

This indicated that the formulation adjustment had brought the color on the production line back toward the standard color before a visually objectionable color variation occurred.

Helpful as are instrumental methods to the color compounder in maintaining uniform color control, the final criterion is, of course, the visual acceptance of the product by the customer.

## Standards

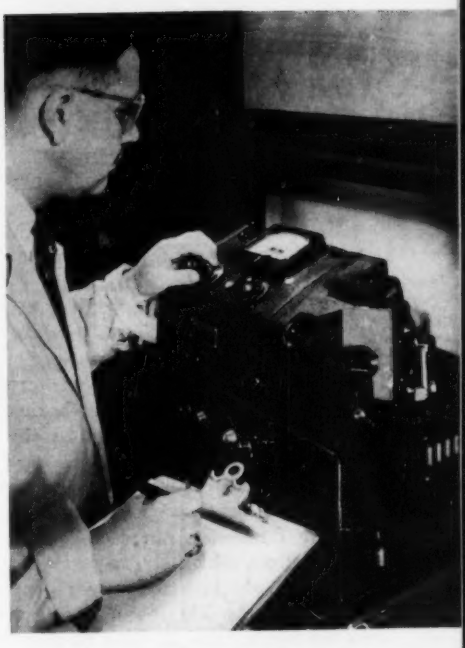
One item that must receive the strictest attention from styrene manufacturers, fabricators, and end users is the careful establishment of color standards. Before the compounder can furnish satisfactory material, he must know exactly what the end user wants. This means that the end user himself must have clearly established color standards. It is, therefore, the mutual responsibility of the molder, end user, and compounder to establish exact and uniform color standards. Failure of any one of these parties to accept this responsibility can lead to confusion, delays in meeting production schedules, off-grade material, and loss of good will. Preferably, each organization involved should have standard samples, all of which match exactly, and these standards alone should be used by all principals involved for the judging of color acceptability.

## Coloring Problems

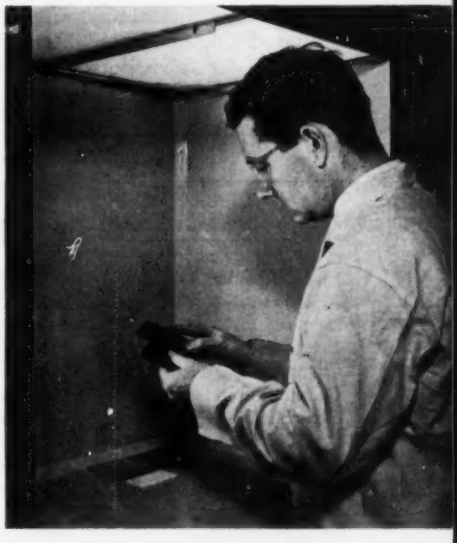
The increased use of styrene has led the molder and commercial designer to stipulate properties which are sometimes difficult for the compounder to obtain. For example, a tile molder may specify a material that will be maroon in the solid color and will also be able to marbleize with white without any significant change in the hue of the maroon. The customary way to make a rich, dark maroon is with a red pigment plus a purple dye. However, when mixed with white, the color of the purple dye predominates, giving a livid purple mottle. For a special application such as this, the maroon intended for marbleizing could be made from a bluish red pigment plus yellow and purple dyes. Such a formulation would result in a maroon that would display a mottle color equivalent to the solid color.

As another example, the fabricator of parts for fluorescent lighting units specifies a translucent white that will transmit a maximum amount of light, yet have enough hiding power to conceal the fluorescent tube. In

(*To page* 199)



Tristimulus colorimeter for color control



Color comparison using standard light unit

**The authors are on the staff of the Kobuta plant of the Chemical Div., Koppers Co., Inc.**



**T. H. Insinger, chief chemist, received his Ph.D. from the University of Pennsylvania in 1940 and joined the Chemical Div. in 1949 after experience with Koppers' Research Dept.**



**J. T. Guyol, senior chemist heads the color laboratory, and joined Koppers in 1948 after receiving a B.S. from Carnegie Institute of Technology that year.**



**J. J. McGovern, assistant chief chemist, obtained his Sc.D. from Carnegie Institute of Technology in 1946 and joined the Chemical Div. in 1950.**

# Coloring Polyethylene

by William J. Goodwin

POLYETHYLENE is used in many new and diverse applications. In some of them color contributes to the sales appeal of the product; in others, color is used for purposes of identification. Special brown and black formulations are used when improved weathering characteristics are required in the finished product.

Because the natural polyethylene resin is milky—except when used in thin films—the range of colored formulations which can be produced are limited to translucent and opaque effects. The major problems in the application of color to polyethylene are the dispersion of colorant in the formulation and the performance of the colorant after it as been dispersed. Since there is a tendency for fabricators to color their products this article will discuss the problems involved in the coloring operations.

Some techniques of dispersion are very simple; others are very complex. Depending on the method which is used, the quality of the finished product will vary. It is desirable to select the degree of dispersion to suit the quality required by the end product. Dispersion of the colorant in polyethylene by the fabricator offers economies in the form of a reduction of inventory and reduction of product cost by not building unused quality into the product.

The performance of the colorant in a polyethylene formulation is equally important. Colorants are chemicals and it is important that they be inert in respect to polyethylene for all conditions of formulation and use. This is true both in relation to their solubility and their reaction with the resin.

**Table I—Colorants Recommended for General Use in Polyethylene**

| *Colorant* | *Supplier* | *Colorant Classification General Type* |
|---|---|---|
| *Red and orange colorants* | | |
| Light red oxide R-2899 | C. K. Williams & Co. | Calcined iron oxide |
| Indian red R-8098 | C. K. Williams & Co. | Calcined iron oxide |
| Deep red 10156 | B. F. Drakenfeld & Co. | Cadmium sulfide selenide |
| Bright red 10150 | B. F. Drakenfeld & Co. | Cadmium sulfide selenide |
| Cadmolith red deep | Chemical & Pigment Co. | Cadmium sulfide selenide |
| Cadmolith red medium | Chemical & Pigment Co. | Cadmium sulfide selenide |
| Cadmolith red light | Chemical & Pigment Co. | Cadmium sulfide selenide |
| *Yellow colorants* | | |
| Cadmolith golden yellow | Chemical & Pigment Co. | Cadmium sulfide |
| Cadmolith lemon yellow | Chemical & Pigment Co. | Cadmium sulfide |
| *Green colorants* | | |
| Opaline green G-1 | Harmon Color Div. | Phthalocyanine green |
| Monastral green GT-674-D | E. I. DuPont | Phthalocyanine green |
| Chromic oxide green X-1134 | Imperial Paper & Color Corp. | Chromic oxide |
| *Blue colorants* | | |
| Luna blue B-36 | Harmon Color Div. | Phthalocyanine blue |
| Monastral blue BG-BT-297-D | E. I. DuPont | Phthalocyanine blue |
| *Black colorants* | | |
| Monarch 74 | Godfrey L. Cabot | Medium color channel black |
| Raven 15 | Binney & Smith | Easy processing channel black |
| *White colorants* | | |
| Ti-Pure FF-CR | E. I. DuPont | Anatase titanium dioxide |
| Titanox A-168-LO | Titanium Pigment Co. | Anatase titanium dioxide |
| Ti-Pure R-110 | E. I. DuPont | Rutile titanium dioxide |
| Titanox RA | Titanium Pigment Co. | Rutile titanium dioxide |
| Zinc Oxide XX-50 | N. J. Zinc Sales Co. | Medium particle size zinc oxide |

## PROCESSING

A flow chart detailing the various steps in the different processing operations is illustrated on p. 105.

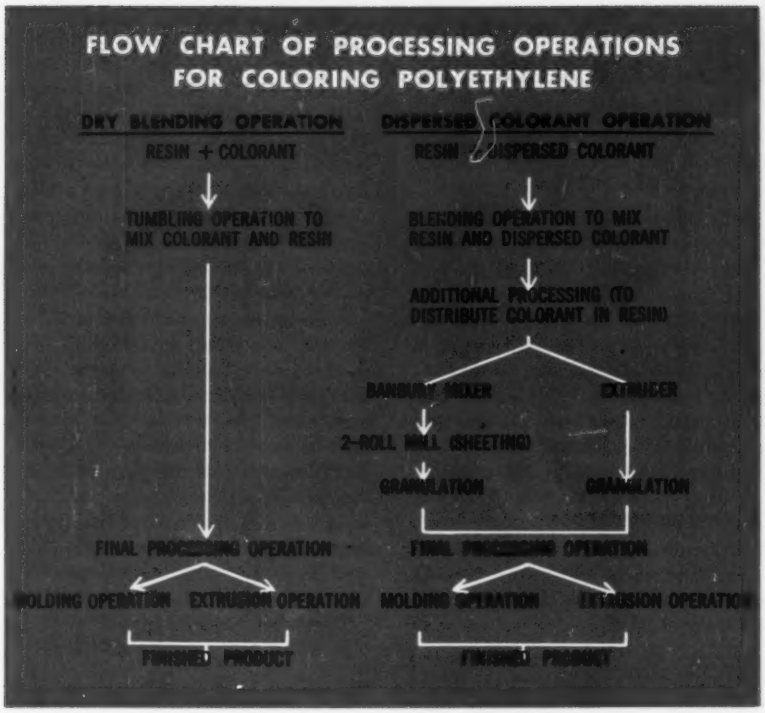
The simplest method of coloring polyethylene is by **dry blending** either directly or by preparing a dry blend master batch. This consists of blending colorant and resin —usually in a tumbling operation. The resulting blend is used directly in an extruding or molding process to produce a finished product. However, some provision must be made to obtain additional mixing in the plasticizing chamber of this equipment. This is usually accomplished by modifying the plasticizing chamber to obtain additional turbulence in the heating chamber.

Very often the colored formulation produced by a dry blending operation is streaked. Some colorant manufacturers recommend the use of wetting agents to improve colorant distribution on the resin. Some additional improvement can be gained, from a visual standpoint, by increasing the opacity of the colored product.

The quality of a colored formula-



**William J. Goodwin, who obtained his A. B. degree from Wooster College, Wooster, Ohio, has been associated with Bakelite Co. as a physicist for the past 15 years. Before coming to Bakelite, he served as Physics Assistant and Instrument Maker at Wilson College, Chambersburg, Pa. His present work involves studies of colorant performances in plastic formulations and color measurement.**




tion can be improved by **dispersing the colorant** with a vehicle which is compatible with polyethylene. This dispersion is used as a master batch which is diluted with natural resin and given additional processing in a Banbury mixer or an extruder.

Paste dispersions in a mineral oil vehicle have been employed in place of a master batch. Mineral oil is generally compatible with polyethylene in less than a concentration of 2 percent. Above this concentration spewing may occur. Formulations containing mineral oil generally degrade electrically upon aging.

Improved dispersion of colorant results in a better looking product. In some applications the weathering performance of a product is a direct function of the dispersion.

## COLORANT PERFORMANCE

Satisfactory colorants for polyethylene should not: 1) migrate from the resin; 2) react with the resin; or 3) decompose during processing. **Migration and Reaction of Colorants in the Resin**—Migration is evidenced by bleeding, crocking or spewing; reaction with the resin as odor development or brittleness; and decomposition as color change of the colorant.

Bleeding, generally most pronounced with oil-soluble colorants, is characterized as the migration of color from one colored formulation to another in direct contact with it. The colorant cannot be rubbed from the sample surface. When bleeding occurs, its intensity is proportional to the colorant concentration.

A simple screening test, which can be used to eliminate oil-soluble colorants, can be made by checking the colorants' solubility in toluene. There is no need for checking this class of colorants directly in the resin. However, there are some colorants which are not soluble when tested in this manner but which will bleed. These colorants are practically insoluble at room temperature but are soluble in polyethylene at the temperature at which polyethylene is formulated. Tests on this type of colorant should be made in the formulation.

Crocking is the migration of the colorant from within the sample to its surface where it can be rubbed off. This can be determined by a modified A.A.T.C. Crockmeter. It represents a different kind of solubility. The degree of crocking is not a direct function of colorant concentration since some colorants crock only at low concentrations, others only at high concentrations, while a few crock over a wide range of concentrations. Crocking may occur immediately or after a period of time. In a few instances it has occurred after a five-year period.

Spewing parallels crocking except that it applies to a relatively colorless exudate resulting from an incompatible additive to polyethyl-

(*To page* 196)

**Table II—Colorants Having Limited Color Matching Application**

| *Colorant* | *Supplier* | *Test Temp., °F* | *Colorant Classification General Type* |
|---|---|---|---|
| Pink F-4869 | Ferro Corp. | 590 | Calcined product |
| Red brown F-6112 | Ferro Corp. | 590 | Calcined product |
| Dark yellow brown F-6112 | Ferro Corp. | 590 | Calcined product |
| Canary yellow 10061 | B. F. Drakenfeld | 590 | Calcined product |
| Albron 606 | Aluminum Co. of America | 590 | Aluminum powder |
| Albron 408 | Aluminum Co. of America | 590 | Aluminum powder |

**Table III—Colorants Having Reduced Heat Stability Performance**

| | | | |
|---|---|---|---|
| Rex orange 1939 | Imperial Paper & Color Corp. | 410 | Molybdate orange |
| Mapico brown #420 | Binney and Smith | 410 | Iron oxide (hydrated) |
| Mapico yell. lemon | Binney and Smith | 410 | Iron oxide (hydrated) |
| Hoover brown 3565 | C. E. Hoover | 410 | Iron oxide |
| Chrome yellow ZM | American Cyanamid Co. | 410 | Lead chromate |
| Chrome yellow lt. Y-404-D | DuPont | 410 | Lead chromate |
| Lemon chrome yell. 40-2450 | American Cyanamid Co. | 410 | Lead chromate |
| Primrose yellow A-3042 | Imperial Paper & Color Corp. | 410 | Lead chromate |

# Colorants for Vinyls

by D. H. Parker

ONE of the principal reasons for the rapid growth of the vinyl industry is the relative ease with which color pigments can be incorporated in vinyl compounds. Color adds to the eye-appeal and salability of vinyl products, particularly the consumer items. Flooring, upholstery material, and toys are only a few of the major markets for vinyls made possible by their colorability. Almost without exception, the vinyl compounds which go into the manufacture of industrial and consumer items contain a color pigment. The selection of color pigments, therefore, is an important consideration in formulating vinyl.

The coloring of elastomeric and rigid polymers and copolymers of vinyl chloride, vinylidene chloride, and vinyl acetate presents certain unique problems because of the effect of colorants on the stability and other properties of such plastics and the effect of stabilizers on the performance of colorants.

## Color Requirements

The formulation, processing, and forming of vinyl plastics is largely determined by the manufacturing equipment available, the properties desired in the end product, and cost.

Colorants, stabilizers, and lubricants must often be varied, however, in the formulation of these plastics. The colorants selected should, preferably, improve the properties of the vinyls or, at least, have as little adverse effect as possible. The stabilizers and lubricants should be selected to give the best results with each combination of colorants.

Some colorants, stabilizers and lubricants are quite specific with regard to their behavior with each other while others have certain general class characteristics. Part of the technical background of the manufacturers of vinyl type rigid elastomeric plastics is a broad knowledge of the inter-related performance characteristics of colorants, stabilizers, and lubricants to produce products of the best possible quality.

There are certain general principles which will be discussed here.

## Pigments and Stabilizers

Pigments which consist of discrete solid particles of colored matter, insoluble but easily dispersed in the plastic stock, are generally preferred to pigments or dyes which are even partially soluble. Solubility may lead to bronzing, crocking, and migration which is often undesirable in plastics. Many dyes also lack the heat and light stability which are generally required. Thus, only pigments are listed in the Table at left.

Pigments which contain lead, such as the chrome yellows, molybdate orange, etc., tend to have a stabilizing action on the vinyls because of their lead content. They do not bronze, crock, or migrate and are

(*To page* 198)

### Commonly Used Pigments for Vinyls

| | Type | Crock | Migration | Heat Res. | Vol. Res. | Lightfastness: Low | Lightfastness: High | Lightfastness: Tint |
|---|---|---|---|---|---|---|---|---|
| WHITE | Rutile tit. dioxide | None | None | Ex. | Poor | | | |
| | Calcium carbonate | None | None | Ex. | Good | | | |
| | Clay | None | None | Ex. | Ex. | | | |
| | Calcium sulfate | None | None | Ex. | —[1] | | | |
| | Barium sulfate | None | None | Ex. | — | | | |
| BLACK | Carbon black | None | None | Ex. | Ex. | Ex. | Ex. | Ex. |
| | Lamp black | None | None | Ex. | Fair | Ex. | Ex. | Ex. |
| | Bone black | None | None | Ex. | Poor | Ex. | Ex. | Ex. |
| YELLOW | Chrome yellow | None | None | Good | Fair | Good | Good | 1[2] |
| | Iron oxide yellow | None | None | 1 | Fair | Good | Good | Good |
| | Benzidene yellow | 1 | 1 | Ex. | Ex. | Good | Good | Fair |
| | Nickel azo yellow | 2[3] | 2 | Good | Ex. | Ex. | Ex. | Ex. |
| | Cadmium yellow | None | None | Good | Fair | Good | Good | Good |
| ORANGE | Molybdate orange | None | None | Good | Fair | Good | Ex. | Good |
| | Dianisidine orange | 2 | 2 | Good | Ex. | Fair | Good | Fair |
| | Pyrazolone orange | 2 | 2 | Fair | Poor | Good | Good | Good |
| | Cadmium orange | None | None | Good | Fair | Good | Good | Good |
| BLUE | Phthalocyanine blue | None | None | Ex. | Ex. | Ex. | Ex. | Good |
| | Ultramarine blue | None | None | Fair | — | Poor | Fair | Poor |
| | Indanthrene blue | None | None | Ex. | Ex. | Ex. | Ex. | Good |
| GREEN | Phthalocyanine green | None | None | Ex. | Good | Ex. | Ex. | Good |
| | Chromium oxide green | None | None | Good | — | Good | Good | Good |
| RED | Iron oxide red | None | None | 1 | Fair | Ex. | Ex. | Ex. |
| | Cadmium red | None | None | Ex. | Fair | Ex. | Ex. | Ex. |
| | Pigment scarlet | None | None | Fx. | Ex. | Fair | Good | Fair |
| | Calcium red 2B (B.O.N.) | 1 | 1 | Ex. | Fair | Good | Good | Good |
| | Pyrazolone red | 1 | 1 | Good | Fair | 1 | 1 | 1 |
| | Indo red | 1 | 1 | Good | Fair | Good | Good | Good |
| | Lithol rubine | 1 | 1 | Fair | Good | Poor | Fair | Poor |
| MAROON | Iron oxide maroon | None | None | Good | Fair | Good | Ex. | Good |
| | Cadmium maroon | None | None | Ex. | Fair | Good | Good | Good |
| | Indo maroon | 1 | 1 | Good | — | Good | Good | Good |

[1] No data. [2] 1-Depends on specific pigment and formulation. [3] 2-Depends on specific formulation.



**D. H. Parker, author of the accompanying article, "Colorants for Vinyls," has been associated with the inorganic and organic pigment business for twenty years in various capacities in both the technical and sales ends. For the past five years he has been associated with Harmon Colors, Div. B. F. Goodrich Chemical Co., as a sales representative.**

# Tomorrow's Mirrors may be virtually unbreakable—thanks to plastics

IN ANCIENT times, mirrors were polished sheets of metal—unbreakable, but optically imperfect. When back-silvered glass mirrors came into common usage in later days, the problems of optical perfection were solved—at the expense, however, of unbreakability.

Now, with the introduction of plastics mirrors (transparent plastics sheets coated on one side with metal), a final stage in the development of the mirror has been reached. Plastics mirrors represent the first combination, in a single mirror, of the two most desirable qualities in any mirror—true reflection of an image and, in the popular sense of the word, virtual indestructibility.

## Cast Allyl Sheet

Acrylite Corp., Rutherford, N. J., one of the more recent entries to the field, offers a typical line of quality plastics mirrors for industrial or home applications.

The Acrylite mirrors are made from CR-39 allyl diglycol carbonate sheet stock. According to Acrylite, the cast allyl sheet was chosen for this application because of its outstanding resistance to abrasion and heat, its resistance to chemical solvents, and its ability to pipe light. In addition, from the standpoint of impact resistance, the CR-39 is, of course, far superior to polished plate glass.

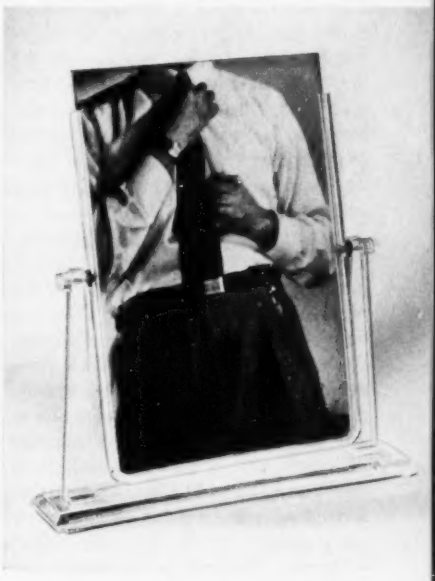
In preparing the transparent allyl sheet for manufacture, the back surface of the sheet is first wiped clean and treated electrostatically. The material is then dipped into three separate chemical cleaning solutions—developed by Acrylite—and dried by a hot-air blower. Next, a silver coat is sprayed-on over the back surface of the sheet and a protective layer of shellac is applied over the silver.

Thanks to the chemical and abrasion resistance of CR-39, there is little danger of the material crazing or being scratched during these operations.

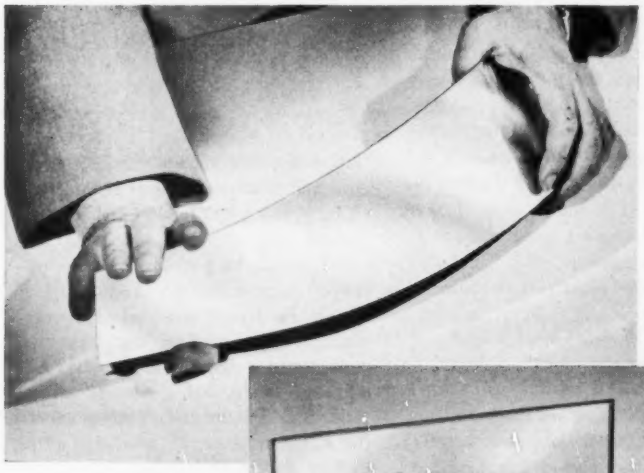
As a final decorative finish to be applied over the shellac, Acrylite has experimented with several materials, including a black rubber-based paint and an attractive grey phenolic-based paint. The back surfaces of the mirrors have also been successfully flocked.

Special decorative effects to appear on the mirror surface also offer a wide range of possibilities. In manufacturing a souvenir pocket mirror, for example, Acrylite silk-screened the desired copy on the back of the mirror in reverse before applying the silver coating. For another

(*To page* 200)

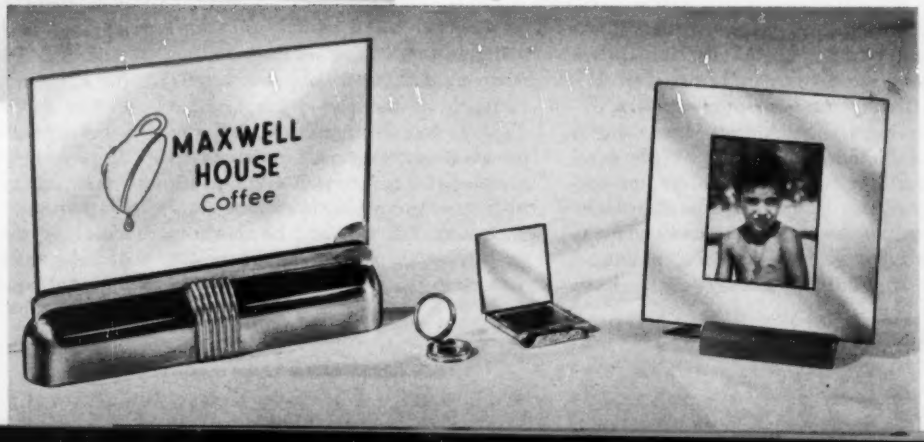


Cast allyl sheet mirror with sprayed-on silver backing reflects true image



Plastics mirrors, which can be produced in varying degrees of flexibility, will bend without breaking

Applications for the rugged new product include (left to right): display signs, compacts, and picture frames



# At the 6TH N. P. E.

**The analytical report on the 6th National Plastics Exposition and Conference presented below has a two-fold purpose. To those who were unable to attend, it will give a quick survey of the most significant developments in applications, materials, and machines displayed there. To those who were at the show, it is hoped that it will serve as a supplement to their own observations.**

A RECORD number of exhibitors, 172 in all, took advantage of the 6th National Plastics Exposition in Cleveland, June 7th through 10th, to show the latest plastics developments. Basic materials, consumer and industrial applications, and new machinery and processing equipment were on display for the almost 18,000 visitors that jammed the Public Auditorium during the 4-day session.

On the basis of the size of attendance and enthusiasm of the visitors, it was generally agreed that the 6th N.P.E. was a huge success. Exhibitors interviewed by the MODERN PLASTICS editorial team which covered the show were almost unanimous in their surprise—and a pleasant surprise it was—at the number of inquiries they had to handle each day and the avidity with which information was gobbled up by visiting buyers.

On the other side of the fence, the visitors were equally impressed with the quality of exhibits in the 232 booths that filled over 1¼ acres of space on the Auditorium floor. As was the case at the 5th N.P.E. in Philadelphia in 1952, major emphasis was on solid, proved applications and materials.

## VACUUM FORMING

One development which was barely in evidence at the 5th N.P.E., pretty much dominated the Cleveland show—vacuum forming. In contrast to the one more-or-less experimental machine that was shown at Philadelphia, there were several vacuum forming machines on display and in operation on the Auditorium floor—and they received the biggest play of any of the exhibits.

In addition, nearly every basic material supplier devoted a major share of display to vacuum formed applications. Two of these suppliers, in fact, set up vacuum forming machines in their booths to demonstrate the ease with which this technique could be used on their products.

In reviewing these exhibits, the editors of MODERN PLASTICS found four major end-use categories taking predominance among vacuum formed applications—signs and displays; packaging; toys and novelties; and industrial components. In the latter category, one-piece formed styrene liners for refrigerators were very much in evidence, and it was generally agreed that this one application was developing into an important and profitable market for styrene sheet.

Several suppliers of styrene sheet placed major emphasis on the integral high-gloss surface finish of their materials. As one exhibitor expressed it: "The closer the formed styrene sheets come to porcelain enamel in finish, the more likelihood there is that formed parts may eventually completely replace porcelainized sheet steel for the outer panels, as well as the inner door liners, of refrigerators."

## STYRENE and STYRENE COPOLYMERS

In addition to the several exciting new materials which were announced at the show, the styrene display was distinguished by the presence of several outstanding samples of colorful, well-engineered, high-quality, molded styrene applications. The toys and housewares on exhibit, in particular, bore testimonial to the general upgrading in products that is taking place among the styrene molders.

Styrene copolymer sheet materials and their applications were also very much in evidence. Exhibits showed how such sheet materials can be successfully deep-drawn into attractive, tough housings for business machines, tote boxes, or carrying cases. Several fabricators displayed unusual applications of formed styrene copolymer sheet, ranging from a solution tank for an electrical appliance to a large formed hamper for diapers.

Perhaps the most spectacular of the new materials on display was a moldable styrene foam. An actual demonstration was conducted in which the material, in bead-like form, was expanded by heat to about 30 times its original size and molded to shape. The new material is claimed to have excellent insulation properties, buoyancy, and toughness.

## VINYLS

Another trend obvious to those who had attended earlier shows, was an increasing emphasis on the vinyls —rigid vinyls, vinyl plastisols, and vinyl foam, in particular. One observer commented on the popularity which the vinyls enjoyed at the exposition by pointing out that the conference session on vinyls and rubber (see p. 204 *ff.*) drew an attendance of more than 800—a record for a single general group meeting at any S.P.I. conference.

Some of the vinyl applications on display were no longer new; others were fairly recent developments. Elastomeric vinyl extrusions and moldings were everywhere in evidence, attesting to the growth of this material to the point where it can

become a volume leader. The prevalence of garden hose samples, in particular, was a tribute to the fact that vinyl has by now completely taken over a major part of that market.

Rigid vinyl, although still a small volume item in comparison to elastomeric vinyls, was shown in enough variety to indicate that it is well on the way to consumer acceptance. Disposable containers for acids, oils, and greases; phonograph records; automatic seat guards; highway markers; and a host of vacuum formed signs and displays, were among the many applications shown.

Rigid vinyl pipe, as had been predicted, was given a boost by the presence of injection molded rigid vinyl fittings and valves—lack of which has previously been a problem in the marketing of such pipe.

Among the more promising application possibilities for rigid vinyl that were seen at the show must be included the rapid forming of products with conventional metal stamping equipment. Set up at one booth was a simplified production line in which a 1/20 in. thick rigid sheeting was fed from reels under a bank of strip heaters and into the stamping equipment where it was formed.

Other variations of vinyl materials included: vinyl plastisols or paste resins which can be used for coating or insulation, or can be slush molded into end products; vinyl foam formulations which can be expanded into a spongy, cushion-like material for use in mattresses, pillows, automobile cushions, automobile crash pads, or for gasketing, soundproofing, or insulation; and dry blend vinyl resins, designed for those processors who do not have Banburys or mills.

## PHENOLICS

Most of the molded phenolic applications on display at the exposition were familiar to the readers of MODERN PLASTICS. With the exception of a few new, isolated products, such as a non-corrosive phenolic sump pump, most applications fell under the standard categories of electrical parts, TV set housings molded furniture parts, etc. One trend that was noticeable, however, was the emphasis being placed on large housings for appliances that are molded in one piece.

Looking over the various phenolic molding powders being offered, many visitors expressed interest in the fact that practically every producer had brought out new, improved formulations during the past year that exhibited faster cure, more arc resistance, higher impact strength, and better flow.

Another obvious trend was the big dent that the cast phenolic resins were making in the manufacture of shell molds, wood waste boards, and resin-bound sand foundry molds. Emphasis was also laid on the use of phenolic resins for casting inexpensive molds that would fit into the requirements of the vacuum forming technique.

## REINFORCED PLASTICS

Plastics resins, reinforced with fibrous glass, also had a strong showing on the auditorium floor. As might be expected, the polyester resin-fibrous glass laminates ac-

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# S.P.I. Conference—1954

THE first session of the S.P.I. Conference, which ran concurrently with the 6th National Plastics Exposition, reported above, was opened by J. J. O'Connell, president of S.P.I The welcoming address was by The Hon. Thomas A. Burke, junior senator from Ohio and former mayor of Cleveland.

Speaking on **"The Future of Thermosetting Plastics in Television Cabinets,"** Wyman Goss, Chemical Div., General Electric Co., pointed out that of the 7 million TV sets produced in the U. S. in 1953, about one-half were of the table model variety and one-third of these were of molded phenolic. Virtually unlimited design features, low assembly costs, resistance to scratching, cigaret burns, beverage stains, and excellent dimensional stability were among the advantages of phenolic cabinets cited by the speaker. Nevertheless, he said, the phenolic cabinet is now being challenged by sheet metal wrap-arounds used in conjunction with a thermoplastic face, which sell at about 25% under the cost of a phenolic cabinet. To meet this threat, Mr Goss urged that the designer, tool designer, tool manufacturer, material supplier and molder cooperate to reduce costs and improve production.

• • •

Dan H. L. Jensen, Radio Div., Philco Corp., in **"Design Trends in Radio and Television,"** pointed to the much greater time required to build molds now than was the case several years ago, suggested that the problem of tooling time and costs should be given study by the industry, and recommended that S.P.I. sponsor the compilation of a brochure on advanced tooling methods. Although today's consumers have accepted plastic radio and TV cabinets, Mr. Jensen warned against complacency, reminding listeners that structurally convenient cabinet interiors, combined with good exterior design, are big factors in reducing costs of successful plastic cabinets.

• • •

**"Fully Automatic Molding of Radio and Television Components"** was the topic of L. R. Wanner, Sylvania Electric Products, Inc. Mr. Wanner discussed the products which are now being molded automatically in Sylvania's plastics plant; the automatic molding and finishing equipment used for both thermosetting and thermoplastic materials; plant layout and material handling methods; related aspects of automation on product and mold design, and the labor and skills required as compared with historical molding methods. For an output of approximately 1¼ million parts per day, the Sylvania plant requires a total labor force, including stock handlers, tumbling, finishing, etc., of only 31 persons for a 3-shift operation. This is in addition to 12 operators for the four hand injection machines used.

• • •

The first showing was presented of Zenith Plastics Co.'s dramatic new color movie, **"Futures Unlimited,"**

(*To page* 204)

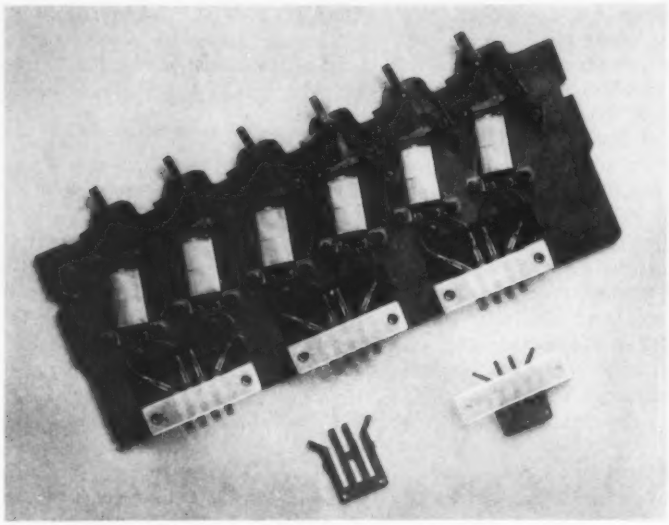


Fig. 1—Molded nylon units for contacts of electronic computer actuator plate assembly solve problems of insulation and bulk (unmounted units in foreground)

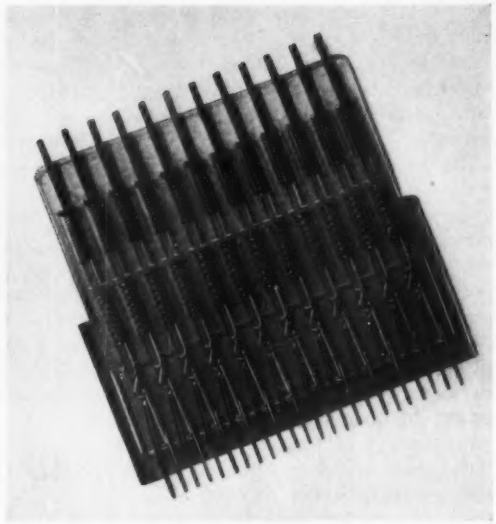


Fig. 2—Molded transparent acrylic sensing unit sandwich assures accurate pin location, good insulation, space savings

# IT ADDS UP TO PLASTICS

Molded plastics components are designed to improve efficiency and appearance of new business machines and electric appliances

**by Thomas A. Sharp***

AS EARLY as 1939, Remington Rand adding machines and calculators were equipped with plastic key-tops produced by injection molding, and cases compression molded of general-purpose phenolics. As compared with the best of metal-forming techniques, the use of plastics for the housings resulted in better finishes and lower production costs. Current production of business machines and equipment yields many other examples of applications of plastics, such as typewriter platen knobs, terminal blocks, switch mountings, and a variety of insulating components.

## Electronic Computers

In addition, the company has found several unique uses for molded plastics that have resulted in additional production economies in time and money. This has been especially true in punched-card equipment and electronic computers, which demand hundreds, sometimes thousands, of compact, identical parts held to close tolerances.

Accompanying illustrations show two uses of molded plastics as applied to components of one series of punched-card electronic computers. Figure 1 is an actuator plate assembly used in the card-sensing unit.

On each of the actuator plate assemblies—there are 90 plates, one for each column in a punch card—are three contact assemblies.

Previously, these contact units had been assembled using metal contacts and machined phenolic laminates chosen for this application because of their dielectric properties. This unit, however, was not considered satisfactory for several reasons and a search was started for a more suitable contact assembly.

In developing a new assembly, there were several factors to be considered. Space, for one, was a factor of importance, since only a little more than 1/10 in. in thickness was available. Accurate positioning of the contacts was also necessary, as was adequate electrical insulation.

The solution that was finally evolved was a molded nylon piece containing four contacts and ready for mounting in the actuator plate. The design of the unit answered all the anticipated problems and further met a demand for ease in production by making use of the "snap-off" method, whereby an extraneous metal strip (originally stamped out as the base which holds the four metal contacts in their correct positions during molding) is broken away after the molding operation.

The molded plastic piece more than doubled the production output rate for actuator plate assemblies.

Another interesting and more complex application of molded plastic materials is the computer's sens-

*Remington Rand Laboratory for Advanced Research, South Norwalk, Conn. See p. 216.

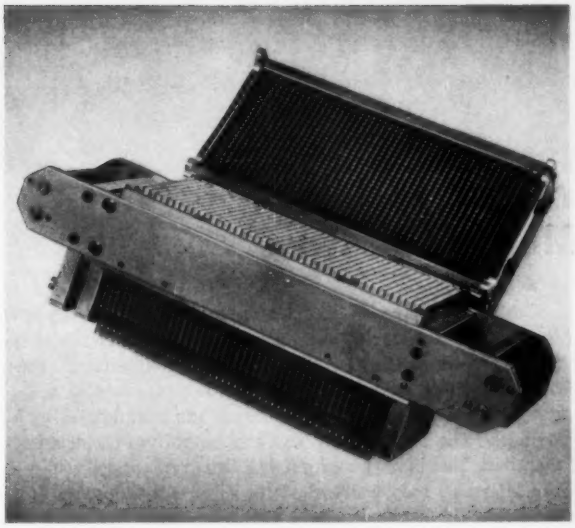


Fig. 3—Sensing unit sandwich mounted in place; clip contacts on upper hinged portion must mate exactly above corresponding contact leaves

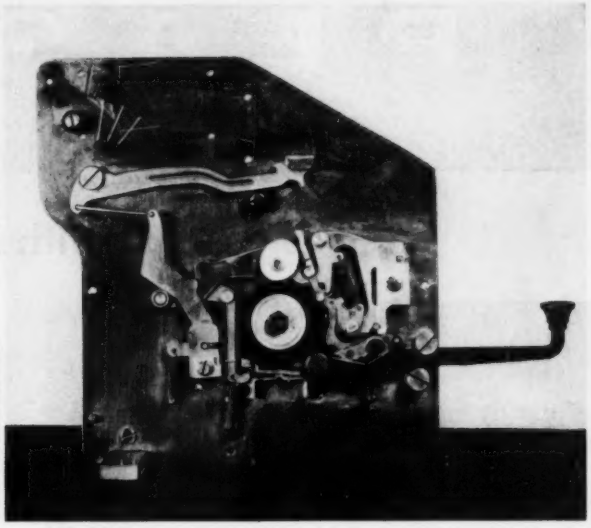


Fig. 4—Model of electric typewriter action shows white nylon cam (center) ready to transfer power from drive roll located just below

ing unit "sandwich." It is necessary to "sense" or "read" the holes punched into the 90-column card by lowering a block of 540 pins over the card while it is held momentarily motionless in the sensing or input slide. These pins, finding free passage through holes in the punch card unit, cause a switching operation to be performed. The design criteria are accuracy of pin positioning (to avoid damage to cards or misreading due to a pin striking the edge of a card and so not finding free passage), insulation of the pins, and space-saving.

In the space equal to the area of a punch card—24 sq. in.—it was necessary to place 1080 electrical contacts, or an "on" and "off" contact for each of the 540 switches actuated by the 540 sensing pins, an engineering team work problem, with the plastics specialist a key man.

The unit layer of the sandwich is shown in Fig. 2, the chain of operation from the sensing pin via springs and plungers to switch leaves and contacts being a straight-line proposition. Transparent acrylic is the plastic used. Figure 3 shows the completed sandwich mounted in its housing. The upper hinged portion of the assembly is composed of two-leaf clip contacts which, when the device is closed, must be mated exactly above the corresponding single contact leaf of the sandwich, without distortion of position that might breed arcing or short-circuits.

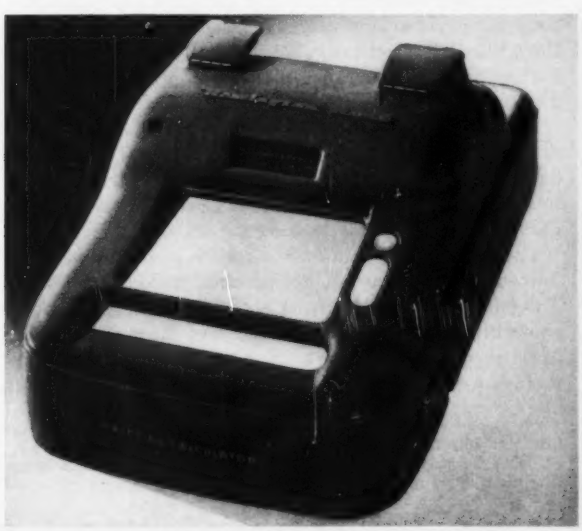
The individual layers are assem-

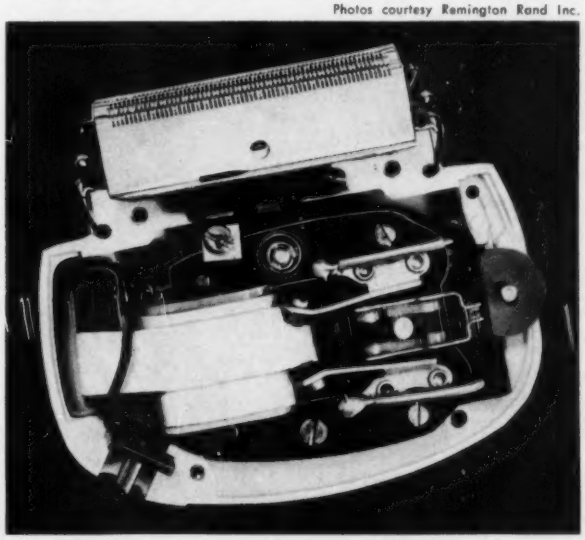
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Fig. 5—Molded phenolic housing of printing calculator, thin-walled for weight saving purposes, provides sturdy protection to operating parts

Fig. 6—Cut-away view of electric shaver shows cam follower (nylon) riding on end of armature shaft; shaft bearing is phenolic laminate

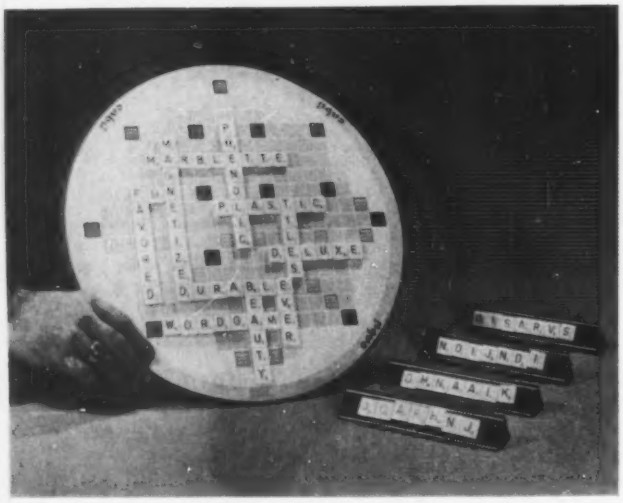
Photos courtesy Remington Rand Inc.





# PLASTICS

## Word Game With Magnetized Tiles




Cast phenolic rods sliced into squares are used as tiles in a new letter-word game called "Cabu." After the rods are cut to ¾-in. squares, a permanent magnet is imbedded in each by heating the tile and pressing the magnet into the softened surface until the magnet is flush with the tile surface. Letters and point values are hot stamped. The clarity and smooth finish of the tiles make the lettering easy to read. Tiles are easily cleaned and are virtually unbreakable and chip-proof.

In addition, the game consists of four letter racks and a circular playing board mounted on a wooden turntable with a felt base to prevent marring of any surface.

The magnetized tiles will hold fast to the board and to each player's letter rack, making it possible for the game to be played on trains, planes, or at the beach. Game comes complete with carrying case.

CREDITS: Manufactured by K & D Leathercraft Co., Maspeth, N. Y. Cast phenolic rods are supplied by Marblette Corp., 37-21 30th St., Long Island City, N. Y.

## Marionette With Molded Acetate Parts



A sailor marionette with a movable mouth that opens at the touch of a string and closes automatically, has head, hands, and shoes molded of cellulose acetate. The marionette, one of the latest additions to an ever expanding line, stands 16 in. tall. The figure has a flexible body constructed of wood and cloth and is dressed in Navy blues. The external acetate parts are washable and shatterproof. Decorations on the face are applied with durable paint and will not chip or fade.

The puppet is operated by simple airplane controls that can be manipulated to make the figure walk, act, dance, and move its mouth in a life-like manner. Two sets of controls operate eight control strings attached to the figure and regulate its movements.

The head with the movable mouth is produced in a four cavity mold on a 6-oz. injection molding machine. The hands are molded in an eight-cavity mold and the shoes in a six-cavity mold. Hands and shoes are molded as finished products. The head is molded in two sections and later cemented together and decorated.

CREDITS: Manufactured by Hazelle's Marionettes, 905 E. 10th St., Kansas City, Mo. Cellulose acetate supplied by Eastman Chemical Products, Inc., Kingsport, Tenn.

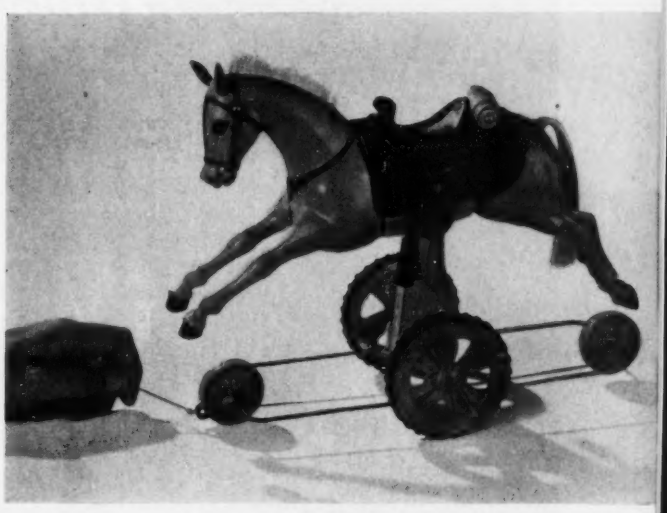
# PRODUCTS

## Bucking Horse Pull Toy Has Saran Mane

Pulling a toy horse called "Bucky the Bronc" sets off a series of motions which involve kicking and bucking, tossing mane and flying tail, accompanied by the sound of galloping hooves. Molded of high-impact styrene, the pull toy has a hard, high-luster, non-toxic finish that makes it safe for children of all ages. A removable saddle, also molded of styrene, and a washable saran mane and tail furnish realistic detail and added play value.

When the toy is pulled along, a crank arrangement activated by the turning of the rubber-tired wheels causes the front and hind sections of the horse to move up and down. The speed of pulling the toy regulates its action. A non-tilt stabilizing frame prevents the horse from toppling over in normal use.

The pull toy is molded in a series of molds mounted on 8-, 12-, and 16-oz. injection molding machines.



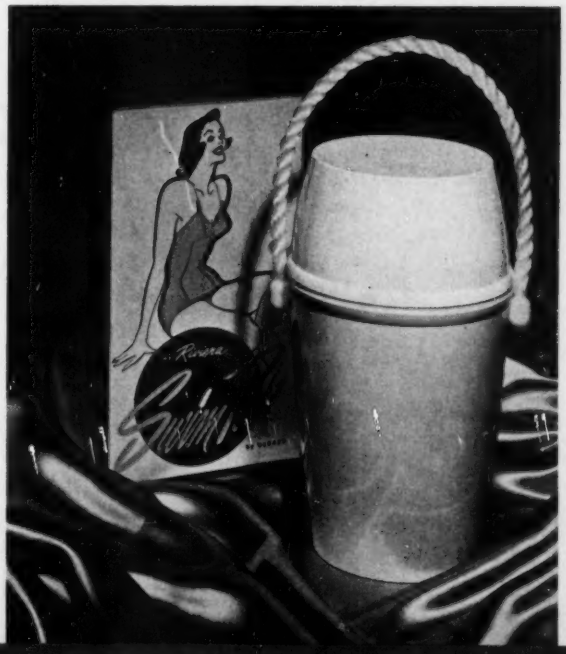
CREDITS: Molded by Alladin Plastics Inc., 5771 W. 96th St., Los Angeles, Calif. Styrene by Monsanto Chemical Co., Springfield, Mass.; saran by The Dow Chemical Co., Midland, Mich.

## Beach Container With Polyethylene Handle

Beach carry-all called "Swim-Pak," molded of high-impact styrene, is designed for carrying a wet bathing suit or personal items such as cigarettes, sun tan lotion, keys, etc. A screw-on top threads into the bottom section to make a waterproof and airtight unit which will easily withstand the abuse commonly associated with the beach. The Swim-Pak has a flexible spirally braided polyethylene carrying handle which is strong and impervious to the corrosive action of the sun and sea water.

The top and bottom pieces of the Swim-Pak are separately molded in two single-cavity molds in a 12-oz. injection molding machine. The polyethylene carrying handle is joined to both sides of the container by means of metal rivets which are inserted into holes fabricated into the body after molding.

Swim-Pak is available with pink, green, blue, and yellow bottoms and white tops. Dimensions are 9 in. high and 5 in. in diameter.




CREDITS: Molded by Buffalo Molded Plastics, Inc., 3230 Union Rd., Buffalo 25, N. Y. for Gerard Industries, 2268 Albion St., Toledo 6, Ohio. High-impact styrene by The Dow Chemical Co., Midland, Mich. Polyethylene rope supplied by U. S. Plastics Rope Inc., Redwood City, Calif. Polyethylene by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

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PLASTICS ENGINEERING*

F. B. Stanley, Engineering Editor

# New Tools, New Plant for Car Bodies

Production of reinforced plastics automobile body parts by compression molding required special methods, equipment, and molds in single-purpose plant

IF FIBROUS GLASS-reinforced polyesters had never been identified as "low pressure" plastics, volume use might have developed much more rapidly. For the first five years of the decade that these materials were on the market, they were not handled by compression molding techniques. The whole concept of large area reinforced plastics pieces centered around low pressure molding in low-cost, short-run tools.

It has taken a lot of courage on the part of many people to bring reinforced polyesters to their present position of molding efficiency. Indeed, there was even a fair amount of betting in the industry that really large pieces would never be successfully and economically made by compression molding of these materials in steel production dies. Now it is being done. The 84 molded reinforced plastics parts which comprise the body of the first high production sports car are all being made in compression molds at Molded Fiber Glass Body Co., Ashtabula, Ohio. All molds are made of either machined high-carbon steel plate or machined alloy castings. Some of the smaller parts are produced from tailored sections of mat, but all of the larger parts are made from chopped glass fiber preforms. The magnitude of the project is indicated by the size and weight of the largest part: 120 in. long, 70 in. wide, and 26 in. deep; and weighing 85 pounds.



All photos courtesy Owens-Corning Fiberglas Corp.

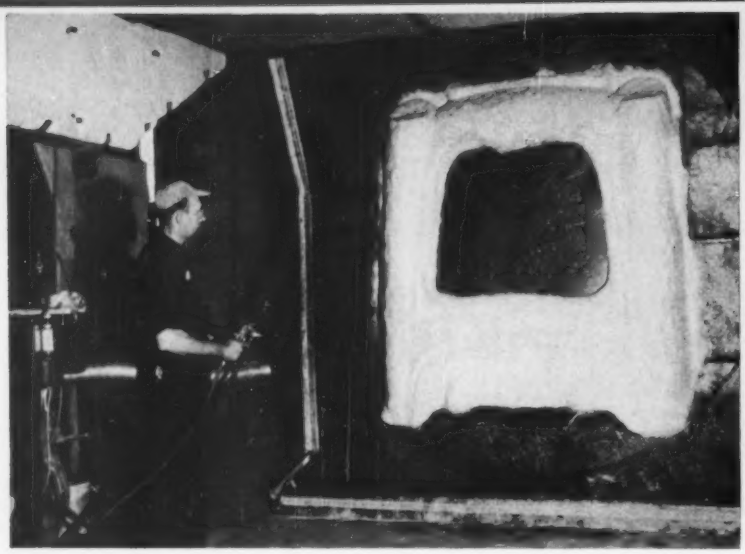
**View of press line for the production of fibrous glass-reinforced plastics automobile bodies. Tool makers in left foreground are "barbering" one of the production molds**

**Production line seen from the other end. The complete press line consists of 25 compression presses, the largest of which is a 600-ton unit with 7- by 12-ft. platen area**

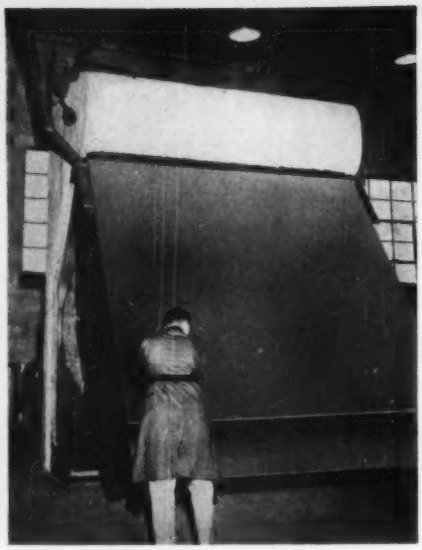


## Special Equipment Needed

When the project of building and equipping a plant expressly for the high-speed manufacture of automotive body parts was first discussed,



**1A** Operator, using spray hose and spray gun, has just completed distribution of correct weight of glass and bonding emulsion to preform screen for a large car body part.



**1B** Door of preformer is closed preparatory to applying heat for cure of bonding emulsion

it was found that much of the necessary equipment would have to be especially designed. For example, vacuum preformers then available could not produce the large size preforms needed for many of the body components. And even if they could, the task of handling and setting the bonding resin in a preform 10 by 6 by 2 ft., would obviously be tremendous. By methods then in use, it would involve removing the preform and shaped screen from the preformer and passing them both through an oven, removing the preform from the screen, and then relocating the screen in position on the preformer. It was immediately apparent that some other method and newly designed equipment would have to be developed for this operation. This is but one example of several production steps which demanded equipment of types not then available.

After all of these problems had been overcome in the theoretical or design stage, it was possible for the engineers to lay out a plant which would properly house the equipment and provide sufficient space for the necessary conveyors and "in-process" storage. Well over a year was required to complete the design and building of the equipment, the building of the plant, and the installation of the various presses, preformers, ovens, pumps, boilers, and other machines.

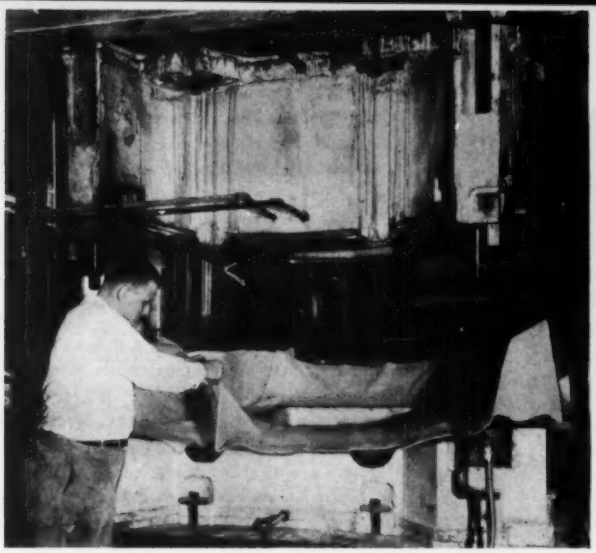
The plant, with a floor area of 34,000 sq. ft., now has in operation six special preformers of a medium size on which preforms up to 20 sq. ft. in area can be produced; two larger preformers having a capacity of 40 sq. ft.; and one very large unit on which preforms up to 100 sq. ft. in area can be made.

Close-up of mold for underbody component of sports car. Tool makers are putting finishing touches on certain parts of force plug which have not been precisely machined

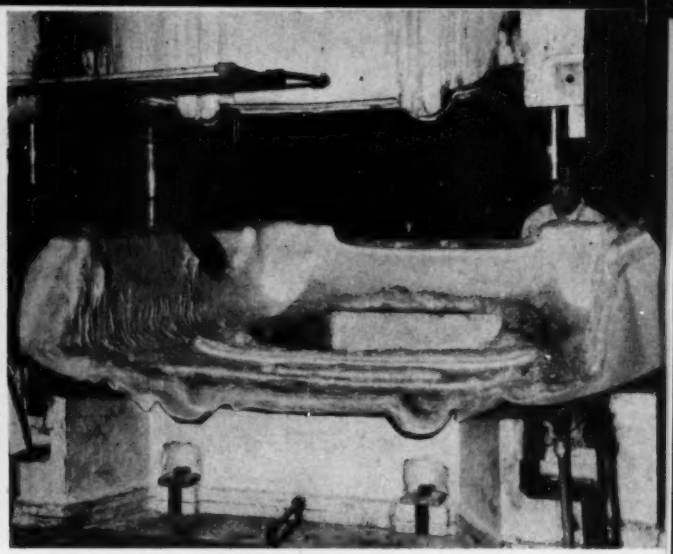


## Press Line-Up

The compression presses are set up in two lines, one line consisting of a group of large presses, while the second line is made up of smaller units. Of the 25 presses in this plant, the 10 smallest each have a platen area of 20 by 20 in. between strain rods and a maximum stroke of 21 inches. These 10 units have adjustable daylight openings which may be varied from 24 to 30 in., and operate at 18 tons on the 2000 p.s.i. line pressure available from the accumulators. Each of six other presses has a platen area of 42 by 48 in., a stroke of 50 in., adjustable daylight from 42 to 70 in., and furnishes 100 tons of pressure. In addition, there are six more presses, each of which has a platen area of 54 by 50 in., with 50



**1C** Two layers of 0.015-in. glass mat ("veil") are being laid up in cavity of large mold for part having compound curvatures



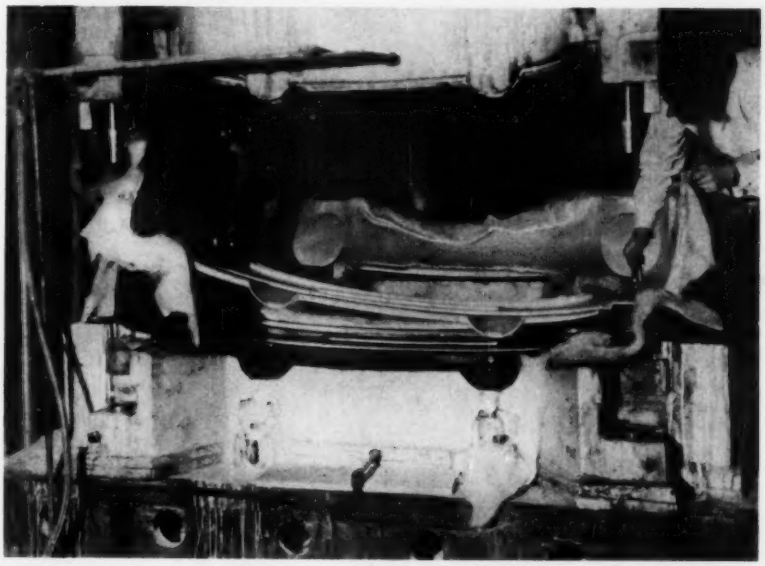
**1D** After fibrous glass preform has been laid on top of the veil, and before mold is closed, the resin mixture is applied to its surface

in. maximum stroke, and adjustable daylight from 56 to 80 inches. These presses are also 100-ton units. Each of two very large presses has a platen area of 96 by 96 in. and a 50-in. maximum stroke. These are 400-ton presses and have adjustable daylight from 58 to 80 inches. The largest press is really huge for the plastics industry. It is a 600-ton unit with a platen area of 7 by 12 ft., a maximum stroke of 50 in., and adjustable daylight from 58 to 80 inches.

## Steam-Heated Molds

All molds which are used in these presses are cored for steam circulation, except some shallow dies which are mounted on steam-heated plates. Steam is furnished from two boilers, one having a capacity of 40 and the other of 50 horsepowers. These boilers are heated by natural gas and are operated at a line pressure of 50 p.s.i., which figures out to a temperature of 280° F. Pressure reducers are used at each press to secure the desired temperature.

All of these presses were especially built for this plant by Erie Engine & Manufacturing Co. and are all equipped with Eagle Signal Co. timing controls which have an adjustable time-out from 0 to 10 minutes. Vickers solenoid valves are used for both high and low pressure control, and on all but the three largest presses, 2-in. four-way valves control the low and ¾-in. four-way valves control the high pressure. On the three largest presses, 3-in. four-way valves are required for the low and 1¼-in. four-way valves for the high.

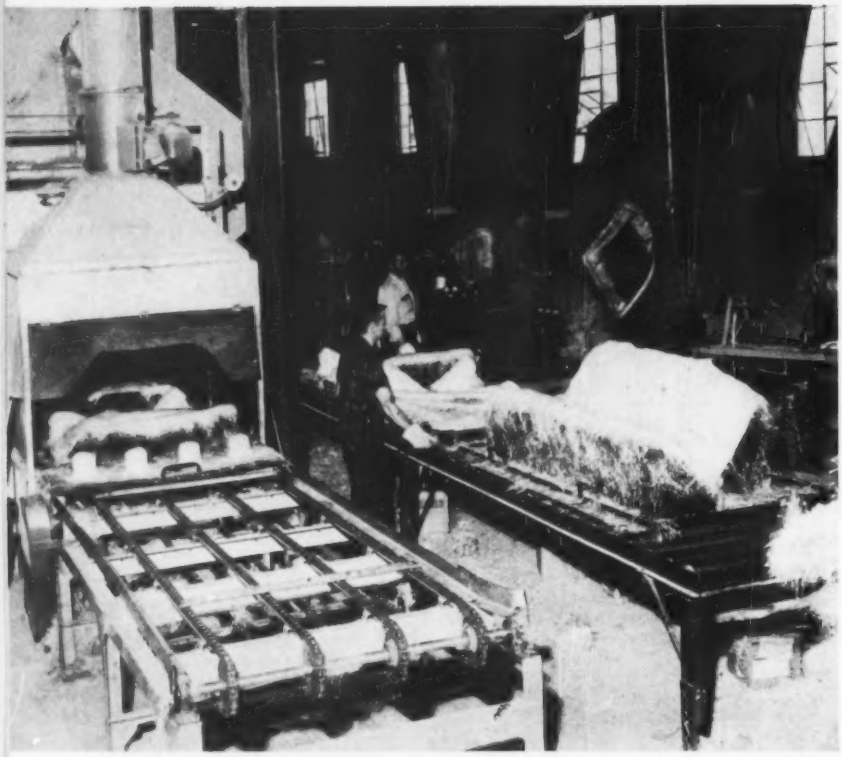


**1E** Pressure applied by the closing mold uniformly distributes the resin throughout the preform fibers; after a 4-min. cure, mold is opened and the cured piece removed

A large, natural gas-heated oven manufactured by Ovens For Industry, Inc., is used for setting the bonding emulsion on all but the very largest of the chopped fibrous glass preforms. A pusher-type loader passes the preforms, still on their screens, through this oven. Temperature is held at approximately 350° F., which sets up the resin in a matter of minutes. Since this set-up time element is not critical, there is no need for too careful control of the time which each preform takes to pass through the oven.

## Oven-Preformer

Setting up of the bonding resin on the larger preforms is accomplished with the screen and preform still mounted on the turntable of the preformer. An ingeniously counterweighted door, hinged at the top of the preformer, is so mounted that it can be swung down on the preform to completely enclose it. Natural gas direct-fired units supplying 1.5



**2A** Preforming and curing oven section of plant shows spray-type preformers in background; in right foreground is a seat bulkhead preform still on its screen

million B.T.U. furnish the necessary heat for the short time necessary to set up the emulsion, after which the door is opened and the preform removed from the screen. This ingenious combination of oven and preformer in one unit eliminates the problem of handling large and heavy screens.

In a plant of this size, a great deal of resin must be mixed with fillers, catalysts, and inhibitors. This procedure is further complicated by the fact that parts of different size and shape require different mixes. One section of the plant is devoted entirely to this mixing operation. Here are installed scales, mixers, and electric chain hoists on overhead conveyors; a large area is also provided for storage of the various necessary materials.

While some of the finishing operations are performed by press operators, the major portion is done in a section of the plant which is devoted exclusively and completely to these operations.

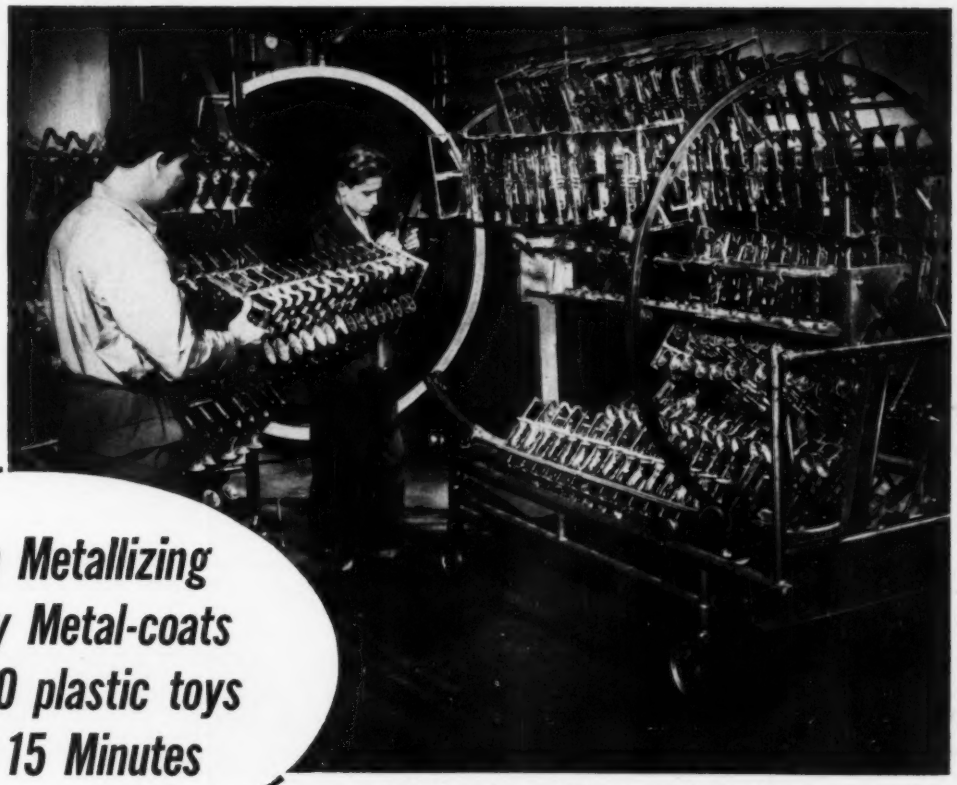
Because of the large number of parts being produced, and the large size of many of them, the problem



**2B** Matched metal mold is about to close on seat bulkhead preform which has been impregnated with inhibited polyester



**2C** After 4-min. cure with a mold temperature of 250° F., the mold is opened and the finished part removed from force plug



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**3A** Fibrous glass and binder are blown on seat divider preform; these units are preformed and molded two at a time, then split



**3B** Removal of molded seat divider from mold poses no special problems; illusion of undercuts is created by planes in design



**3C** Top view (left) and bottom view of sports car seat divider show design details possible with reinforced plastics



**3D** R. S. Morrison, president Molded Fiber Glass Body Co., and C. Hoover, consultant, Owens-Corning Fiberglas Corp., examine finished pieces

of insuring a smooth flow of in-process parts is very apparent. A bottle neck developing at any step would shortly cause a serious pile-up of work. The plant layout, however, has been arranged in such a manner that this problem of possible production hold-ups has been largely overcome.

## Production Details

Now that this plant is completed and in successful operation, it is possible to give specific details on the production of some of the parts that have posed unusual molding problems. For example, one of the larger components, which weighs 36 lb., measures 70 by 73 by 19 in., and has a uniform wall section of 0.100 in., is molded in one of the 400-ton presses. The first step in producing this "body front top panel" is shown in Fig. 1A (p. 116) in which the operator has just completed distributing the required weight of glass onto the preform screen, while periodically spraying the glass with bonding emulsion. Figure 1B shows the operator closing the door of the preformer, preparatory to turning on the heat to set up the bonding emulsion.

The surface of each exterior body part has either one layer of 0.030-in. Fiberglas overlay mat, or two layers of 0.015-in. overlay mat. Two layers are used where it is necessary to prevent wrinkles which would occur when one layer is applied to parts having compound curvatures. This mat or "veil" is made




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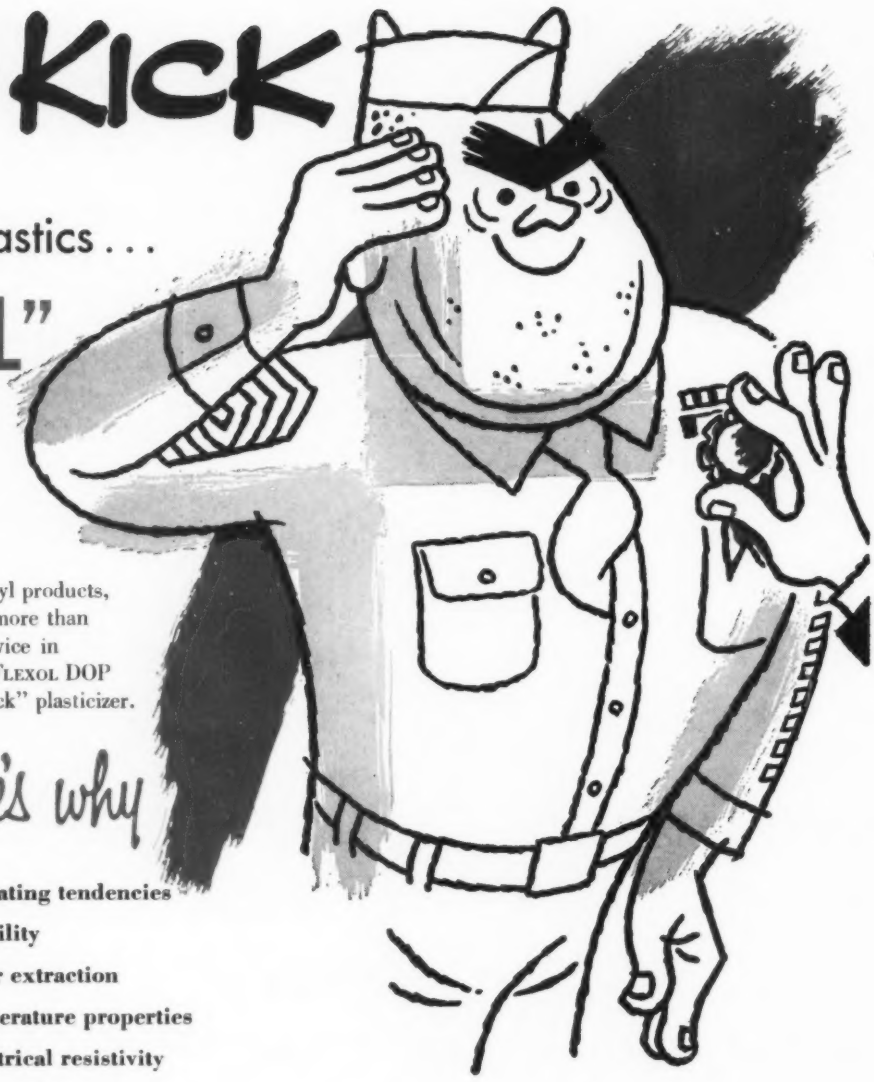
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up of gossamer-fine threads of Fiberglas and gives to the surface of the molded part a much better finish than can be attained by any other method available to date. In Fig. 1C the press operator is laying up this overlay mat in the mold, after which the chopped fiber preform will be placed in position and the required amount of catalyzed and inhibited resin will be applied. Because of the long flow needed for this piece, the resin mix is inhibited to permit it to flow for a longer period of time before jelling. Figure 1D shows the resin-impregnated preform in position just before the mold is closed.

Both the force plug and cavity of this mold are held at a temperature of 240° F.; at this temperature, only 4 min. of cure time is required. Figure 1E shows two press operators removing the cured body front top panel from the mold. They are using suction cups attached to handles to facilitate this operation.

Because of the flame-hardened cut-off at the parting line of this mold, the problem of removing the flash is greatly simplified since most of the excess fibers have been cut through during the molding operation.

Another body part, known as the seat bulkhead, weighs 17 lb., is 70 in. long by 25 in. wide by 18 in. deep.

## Preform Through Oven

The preform for this part is made on the same type of preformer as the part previously described, with the exception that instead of enclosing the preform with a door and curing the emulsion, the preform and screen are removed from the rotating table and passed through an oven. Figure 2A (p. 118) shows a general view of the preforming and emulsion curing section of the plant; in the right foreground can be seen a preform for the seat bulkhead. The operator in the center foreground will transfer the screen and preform to the conveyor at the left, and it will then pass through the emulsion curing oven. At the exit end of this oven the preform will be removed from the screen and conveyed to a storage location near the press in which the mold for this part is mounted. The empty screen will be conveyed back on the roller conveyor, shown in the right foreground in Fig. 2A, and reinstalled on the rotary table of the preformer. Figure 2B shows the resin-impregnated preform in position on the mold just before the mold is closed. In Fig. 2C, the press operators are removing the cured seat bulkhead from the press.

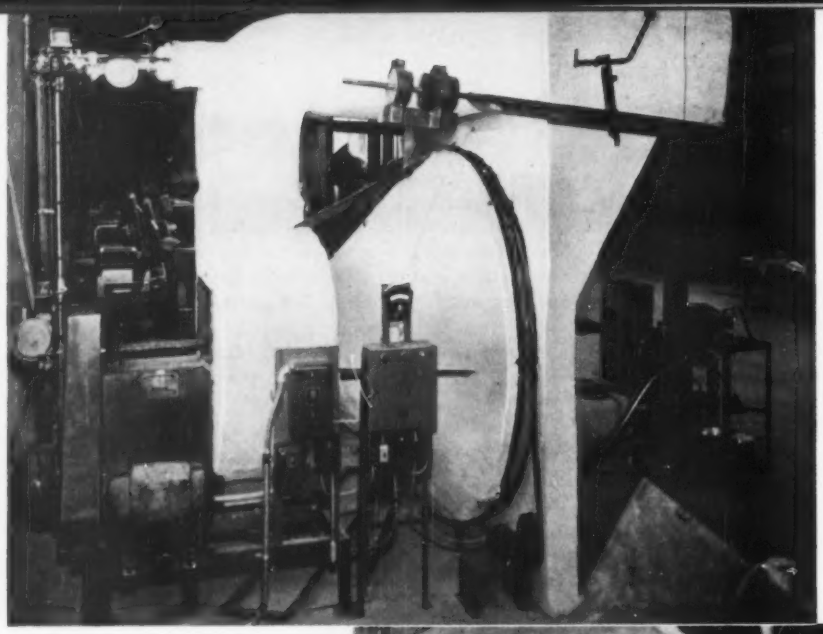
A third unusual molding job, il-



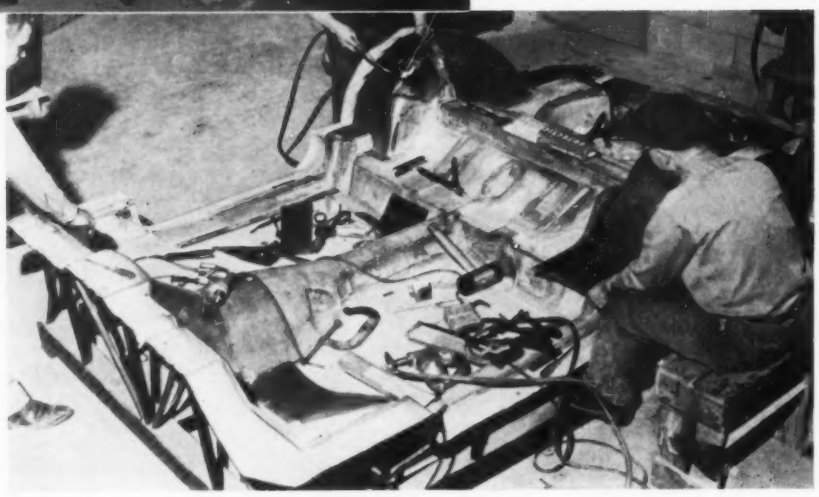
**Decorative fins for sports car are compression molded of polyester glass, and are then bonded to tail lamp housings. Here operators are sanding smooth the areas to which the bonding resin has been applied**



**Specially designed portable equipment for chopping and spraying glass fibers includes pressurized tank of bonding emulsion. In operation, rovings are drawn into a chopper; cut fibers drop into a funnel whence they are sucked into a venturi and blown through a flexible tube. Pressurized container stand is at right of portable unit**



Rear view of large preformer of the type illustrated on p. 123 shows the ingenious hinging and counterweighing system that was developed for the preformer door so that one operator would be able to close and open it with relative ease and facility



Plastic replica of one-half of underbody mold is used as master on which a preform screen is built. Thin perforated metal sheet is hammered into shape and the various sections welded together. Completed screen will be removed from master, and attached to supporting frame

lustrated in Figs. 3A, 3B, 3C, and 3D, (p. 120), is preformed and molded in pairs, which are then separated.

Such molding jobs as those just described and illustrated are now running smoothly, but many trials and tribulations had to be faced during the past several months in order to get all of the large matched metal molds into operation. Already the advantages of compression molding of reinforced plastics over low-pressure methods are making themselves felt. For example, there were many pinholes in all of the parts that were bag molded while the matched metal molds were getting into production. It is stated that approximately 40 man-hours per body were required to fill these pinholes, sand the surface smooth, and apply the finish. The total finishing time for one body is now down to 10 man-hours, and should be reduced still further as production skills and techniques improve.

In discussing the future of operations at Molded Fiber Glass Body Co., its president, Robert S. Morrison, made the following statements:

"I believe that the concentrated effort put on the development of this plant, its specialized equipment, and its products, by not only our own personnel, but also by the technical personnel of materials suppliers and customers, will result in the development of better and more specialized equipment and methods to make higher-quality, lower-cost products possible. The progress of the entire industry has been materially speeded up by this concentration.

"The overall future of reinforced plastics in the automobile industry will depend on cost, quality, finishing, and assembly, and productive capacity per set of dies. At the present time, it appears that the annual productive capacity for one complete set of dies to make all the parts for a car body is about 20,000 cars. However, it might require only four more sets of some of the larger dies, out of the approximately 75 dies now in use, to increase this production rate from 20,000 units to 40,000 units per year.

"Based on present prices, the break-even point, including tool amortization of a molded reinforced plastics car body as compared to a steel car body, is about 15,000 units. We hope, through economies made in our plant and by our materials suppliers, to bring this break-even point up to 25,000 units.

"If further progress can be made, the market for reinforced plastics parts in the automotive industry could increase several times."

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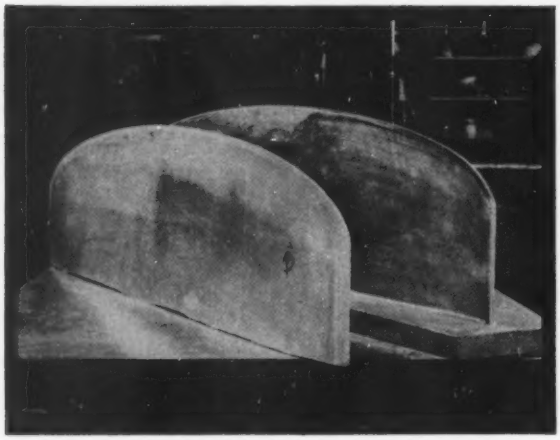
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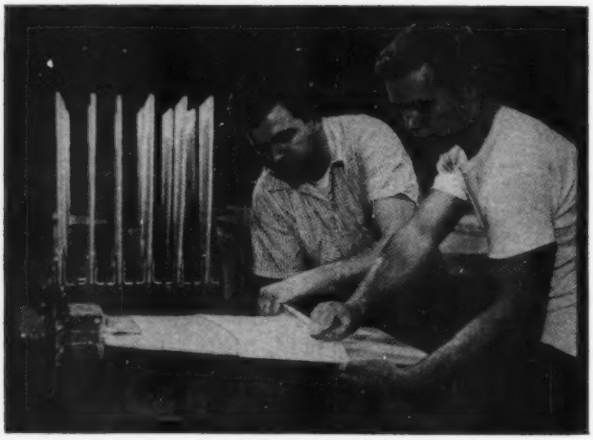
**Matched phenolic dies** for metal forming of aircraft parts, cast from Marblette resin #78, accurately conform to the original blueprint details.



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PLASTICS*
TECHNICAL SECTION: Dr. Gordon M. Kline, Technical Editor

# Research and Standards for the Plastics Industry†

by Gordon M. Kline‡

**The plastics industry will need more research and standards as it grows. A significant part of the research program must be directed toward advancing our knowledge of the fundamental relationships between the structure of polymers and their properties. New developments in materials and applications are dependent upon maintaining this working capital fund of basic information. Marked improvements in the performance of plastics can spring from a better understanding of the physical and chemical processes involved in crystallization, orientation, dynamic loading, and atomic irradiation of polymeric materials. These advances must be backed up by sound technical data that will serve as the basis for standards and specifications for plastics, to guide the engineer in new industrial uses and to provide the buyer with a yardstick of quality.**

**The need for such standards on an international scale is becoming increasingly important because of the growth of world commerce in plastics. The United States, which produces more than half of the world's supply of plastics, has a vital interest in cooperating in the preparation of these international standards. A large, relatively untapped market for the industry exists within our own hemisphere in Central and South America, as evidenced by the increasing number of subsidiary companies being established there by United States chemical firms.**

**A dynamic program of research and engineering studies on plastics calls for industry cooperation and teamwork. The record of similar activities in other industries, such as textiles, paper, leather, and petroleum, indicates that now is the appropriate time to plan and organize such an effort through an industry-supported plastics institute. Establishment of such an institution to serve as a source of basic technical information and to provide specialized training in plastics will be an important step forward toward the position of leadership among the industries of the United States, which is the role forecast for the plastics industry by the President's Materials Policy Commission and outstanding economists.**

THE plastics industry must prepare to take the position of leadership forecast for it by outstanding economists. The chemical industry, of which it is even now a significant part, is growing four to five times as fast as the rest of industry and a 400% increase by 1975 is predicted. The plastics industry will grow at an even more rapid rate according to the economists and will increase 800% during the quarter century 1950-1975. In dollar sales this will essentially carry it from a one billion dollar industry in 1950 to an eight billion dollar industry in 1975. The relative position of the plastics industry in the total chemical industry will advance, according to these predictions, from 17% in 1950 to 32% in 1975.[1, 2]

This growth in the plastics industry will, of course, be accompanied by an expenditure of more dollars for research. The U.S. Department of Labor has reported in "Scientific Research and Development in American Industry" that the chemical industry spent 2.5% ($221 million) of its sales income in 1951 for research compared to 2.0% ($1791 million) for all manufacturing industries. A percentage figure for the plastics industry is not cited. However, it is well established that the greatest industrial research effort is in those fields that are relatively new and rapidly expanding. Hence, it can be expected that 3 to 3.5% of the sales income of the plastics industry is expended in research. This leads to a reasonable estimate that the annual rate of research expenditures in 1975 will approach one quarter billion dollars.

The record of industrial experience shows that a continuous flow of new facts and principles resulting from fundamental research is essential to this future growth of the plastics industry. New developments in materials and applications are dependent upon maintaining this working capital fund of basic information.

A significant part of this research program should be directed toward advancing our knowledge of the fundamental relationships between the structure of polymers and their properties. Marked improvements in the performance of plastics can spring from a better understanding of the physical and chemical processes involved in, for example, crystallization, dynamic loading, high-velocity impact behavior, orientation, and atomic irradiation of polymeric materials. Some illustrations of such research under way in the Div. of Organic and Fibrous Materials at the National Bureau of Standards

*Reg. U. S. Pat. Off.
†Presented at the 1954 Annual Conference of the Society of the Plastics Industry in Cleveland, June 8, 1954.
‡Chief, Div. of Organic and Fibrous Materials, National Bureau of Standards.

[1] "Past and Future Growth of the Chemical Industry," by Raymond H. Ewell, Chem. and Eng. News *29*, 5228 (Dec. 10, 1951).
[2] "The Chemical Industry Facts Book." 1953. Washington: Manufacturing Chemists Assoc., Inc.

will serve to give an indication of the potential applications of the results of this type of investigation.

## Crystallization Studies

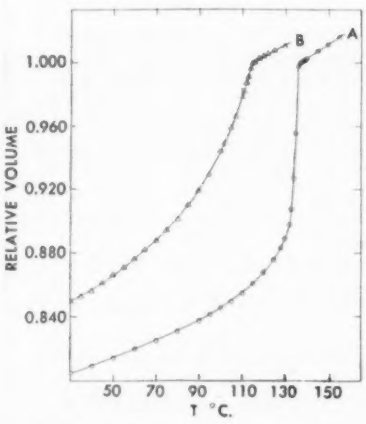
The physical properties of organic polymers and their ultimate end uses as plastics, rubbers, or fibers depend to a marked extent on the presence or absence of crystallinity and the location of the melting temperature. Many materials which are plastics or fibers (e.g., polyethylene, nylon, Dacron, and saran) would be rubbers if they were not crystalline at ordinary temperatures. They do in fact become rubber-like at temperatures above the melting points of the crystals. Moreover, many rubbers owe their strength to the fact that crystals in small amounts are formed on stretching. Some rubbers, on the other hand, are unusable at low temperatures because of crystallization when unstretched. Consequently an understanding of the conditions of formation of crystals and the location of the melting point in terms of chemical and molecular structure are highly important in determining the end uses of plastics, rubbers, and fibers.

In work recently completed it has been shown that crystals in polymers are formed from nuclei that are produced at an approximately constant rate and the crystals grow at a constant rate after initiation. These observations permit the application of much of the theory of crystallization in metals to the study of polymers. These results can be used to predict conditions, respectively favorable or unfavorable, for crystallization to occur. For example, crystallization at low temperatures in synthetic rubbers is found to occur in a reasonable time and only under favorable specified conditions of structure. The concepts developed in these studies form the basis for an understanding of crystallization in polymeric materials in terms of molecular and chemical structure.

## Dynamic Bulk Modulus

In analyzing the response of a rubberlike polymer to mechanical stress, the compressibility is considered negligible in most instances. This is permissible, since in the rubber-like range the shear modulus is lower than the bulk modulus by a factor of 1000 or more. However, at short times or low temperatures (as the glassy state is approached and reached) these two moduli become of the same order of magnitude, and both contribute to the response to stress.

Considerably less is known about the bulk modulus of polymers than about its shear modulus, both from the point of systematic experimental results and molecular interpretations. Some static pressure-volume-temperature data on polymers are available, although no consistent picture relating such phenomena to structure seems evident at the moment. These measurements should




**Crystallization behavior of polymethylene (curve A) and polyethylene (curve B). Polymethylene, a linear polymer, is characterized by the disappearance of the last traces of crystallinity at 136 to 137° C., and 70% of the melting occurs in only a three- to four-degree interval. For polyethylene, a commercial sample known to be highly branched, the melting temperature is lowered to 115° C., and the melting range considerably extended in comparison with that found for the linear polymer**

have a considerable bearing on our understanding of the change in properties at the rubber-glass transition, and should be continued in conjunction with other experiments designed to elucidate the nature of this change.

As regards the dynamic or time-dependent bulk modulus, the only information so far available comes from experiments which involve taking differences between two nearly equal quantities. The evidence from such work indicates that there is a viscous (or energy-dissipating) component of the bulk modulus. It appears, both from the work on polymers and analogous work on low molecular weight materials, that the molecular mechanisms responsible for shear and bulk response are closely similar. It would be highly desirable, however, to have available a method to measure the dynamic bulk modulus directly. Work towards this objective has been underway for about a year. The dynamic bulk modulus is of importance in the behavior of materials in under-water sound equipment and in ordnance applications.

## Impact Behavior

As a part of our basic studies on the structure of natural and synthetic fibrous materials, an instrument has been built for investigating the behavior of these materials under high-velocity impacts, impacts that strain to rupture in 0.001 second. The results obtained to date are leading to new concepts of fiber properties. Basic mathematical formulas are being derived for the velocity of strain propagation and for the strain, stresses, strain energy, and kinetic energy developed at these high rates of straining. Important applications of the work include: development of superior thread for high speed sewing, safety ropes and belts for use by structural workers, and special clothing for use in military, aeronautical, and industrial textiles. The unexpected failure of parachute webbing in low altitude mass landings was explained by simple calculations based upon information gained in our studies, and the way to avoid such failures was indicated.

## Laminar Orientation

Orientation of polymethyl methacrylate plastic by multiaxially stretching a heated cast sheet approximately 100% converts this brittle amorphous material into a tough laminar product. The stretched sheet gives promise of being sufficiently shatter resistant to serve in place of the conventional laminate made with a polyvinyl butyral interlayer as a glazing material on pressurized aircraft, thus effecting savings in cost and weight. The stretched material is also free from the tendency to craze and crack under stress, a troublesome and costly fault of the




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50TH ANNIVERSARY 1904 1954 NAUGATUCK CHEMICAL

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ordinary cast acrylic plastic. This potential contribution to the problem of providing improved glazing materials for aircraft resulted from basic research on the nature of the crazing phenomenon.

## Changes by Irradiation

Pioneering work in 1953 saw the fast-moving atomic energy developments applied to produce useful changes in the physical properties of long chain polymers. Polyethylene irradiated in an atomic pile for a short period becomes cross-linked and withstands temperatures up to 250° C., whereas the melting point of the ordinary polymer is approximately 115° C. General Electric Co. has achieved the same result by the use of gamma radiation from a modified million-volt X-ray machine; a few seconds' bombardment renders polyethylene bottles capable of withstanding steam sterilization. Nylon, polystyrene, polyvinyl alcohol, polyvinyl chloride, and polyethylene glycol have all been cross-linked by pile irradiation. Polytetrafluoroethylene decomposes by chain scission under similar treatment; polyisobutylene is converted to a viscous liquid. Many constructive applications of atomic and electron beam energy in the plastics field can be expected when these research and engineering studies have progressed further.

Research work is under way at the National Bureau of Standards to use this new scientific tool to improve the properties of plastics. In particular, we are interested in the possibilities of raising the softening temperatures of transparent plastics without transforming them into brittle, non-formable cross-linked structures. This is the advantageous feature of this new method of cross-linking. The production of cross-linking by chemical additives usually leads to network formation and, therefore, reduced formability and increased brittleness. Cross-linking by irradiation offers the possibility of limiting the cross-linking to the tieing together of two or more large molecules linearly; i.e., making larger molecules out of already existing large ones. This should lead to a product with higher softening point and greater toughness, but one which is still capable of being formed. It may contribute to filling the need for transparent plastics of higher heat resistance for aircraft glazing.

## Standards for Plastics

These advances in new and improved plastic materials must be backed up by sound technical data that will serve as the basis for standards and specifications for plastics, to guide the engineer in new industrial uses and to provide the buyer with a yardstick of quality.

The development and standardization of testing methods and specifications for plastics in the United States has been a cooperative undertaking involving several technical and trade organizations and technical personnel in industry, government, and universities. The early work was done in the electrical insulation field, which was the predominant market for plastics for many years. Thus, the American Society for Testing Materials' Committee D-9 on Electrical Insulating Materials, which was organized in 1910, was the center of such work until A.S.T.M. Committee D-20 on Plastics was organized in 1937. The organization of the Organic Plastics Section at the National Bureau of Standards in 1935 and the formation of Federal Specification Technical Committee on Plastics in 1941 were further milestones in this transition period to broader markets for plastics.

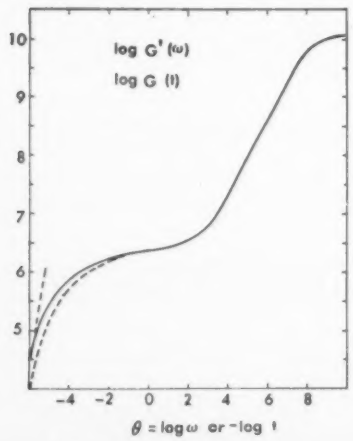
## Testing Methods

A.S.T.M. Committee D-20 on Plastics has subcommittees working on testing methods for strength, hardness, thermal, optical, and permanence properties and analytical and molding procedures. Testing methods for electrical properties are under the jurisdiction of Committee D-9 on Electrical Properties. Some methods of immediate interest to those concerned with applications of synthetic resins are developed by Committee D-1 on Paint, Varnish, Lacquer, and Related Products; Committee D-14 on Adhesives; and Committee C-19 on Structural Sandwich Construction. These methods are published by the Society in the A.S.T.M. Book of Standards and its supplements. Preprints of the annual reports of the committees are also useful sources of current information on the latest methods and revisions, pending publication of annual standards books and supplements.

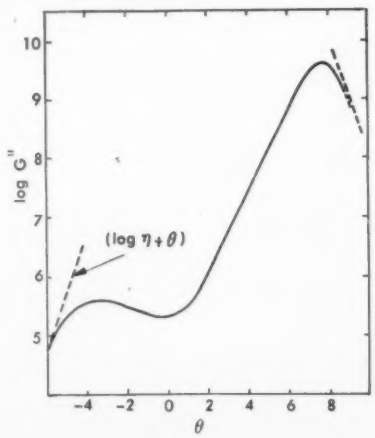
Federal Specification L-P-406 is another important compilation of officially recognized methods of tests in the United States. Revisions of this specification are indicated by letters appended to the number, the current issue being L-P-406b. The methods are numbered in series by type of test, viz.: Mechanical (1000); Thermal (2000); Optical (3000); Electrical (4000); Miscellaneous Physical (5000); Permanence (6000); Chemical (7000).

A.S.T.M. Committees D-9 and D-

**The frequency dependence of the complex shear modulus of polyisobutylene is shown in the two graphs below. These curves are based on results obtained in a cooperative research project involving 27 laboratories in five countries. The dynamic shear modulus is an important factor in the heat build-up that makes presently available synthetic rubbers unsuitable substitutes for natural rubber in heavy-duty truck and military tires**




Real part of dynamic shear modulus




Imaginary part of dynamic shear modulus

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**CABOT's** di-decyl phthalate

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  low cost plasticizer, with plasticizer efficiency of 1.5; up to 50% compatibility with octyl-phthalate type plasticizers

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|---|---|---|---|---|
| SPI Volatility % Loss 24 hours at 90°C. (2 – 0) | 1.1 | 0.49 | 0.80 | 1.3 |
| Water Extraction (Method of E. F. Schulz) % Loss 6 days at 85°C. (8 – 0) | 0.9 | 2.5 | 6.5 | 5.0 |
| Clash & Berg $T_f$ – °C. (0 – -25) | -24 | -6 | -11 | -19 |
| Pound Volume Cost – ¢ (70 – 30) | 30.8 | 64.4 | 51.2 | 38 |
| Parts to give Equivalent 100% Modulus (75 – 50) | 54.5 | 70 | 67 | 56 |

All tests run at an equivalent 100% Modulus

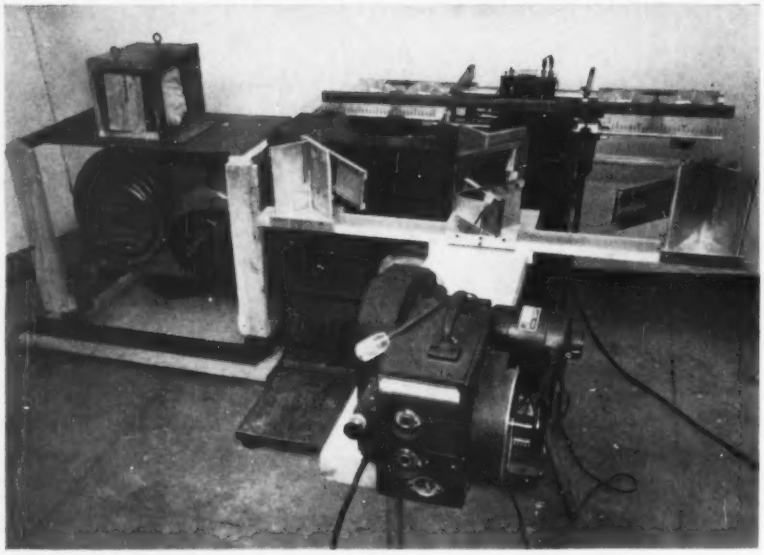


*Cabot makes the Cabflex® DDP, but not the finished product*

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**CABOT PLASTICS CHEMICALS DIVISION**

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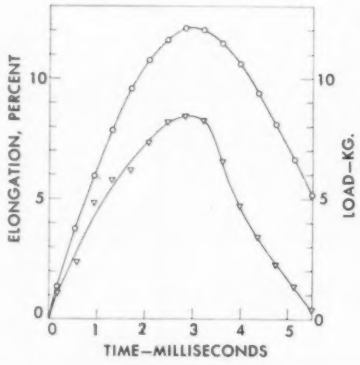
High-speed rotating-disk equipment for impacting one end of a long yarn specimen which has a small weight, equal to 0.01 to 0.05% of the breaking load, attached to the other end. Mirrors, intense illumination, and a high-speed motion picture camera are provided for photographing in silhouette both ends simultaneously on each exposure. From the simultaneous position of the two ends of the specimens against a centimeter scale on each exposure, an elongation-time curve is obtained. From the position of the weight, the velocity and the acceleration of the weight are obtained to give the force (load) versus time curve at the weight. A typical set of such curves is shown below

20 have prepared specifications for many types of commercial plastics, including allyl, cellulose nitrate, acetate and acetate butyrate, ethyl cellulose, melamine, methacrylate, nylon, phenolic, polystyrene, urea, vinyl chloride and chloride-acetate, vinylidene chloride, vulcanized fibre, and thermosetting laminates. These have been published in the A.S.T.M. Book of Standards.

Federal Specifications for materials are largely the counterpart of the A.S.T.M. specifications insofar as property requirements are concerned. This committee has also developed specifications covering various plastic products and end use items made in whole or in part of plastic materials. These are indexed annually in the Index of Federal Specifications and Standards, and are available from the Government Printing Office, Washington, D. C.

## Industry Standards

A number of industry standards have been developed by the Society of the Plastics Industry and other trade organizations, manufacturers, and users in cooperation with the Commodity Standards Div., Office of Technical Services, U. S. Dept. of Commerce, and the National Bureau of Standards, as follows:




Typical elongation-time and load-time curves for a yarn loaded at an impact speed of approximately 30 m./sec. to about 75% of its rupture load, and then unloaded. From them the load-elongation curve for loading and unloading can be plotted and basic properties evaluated

Commercial Standards—

CS147-47, "Colors for Molded Urea Plastics," 1947.

CS156-49, "Colors for Polystyrene Plastics," 1949.

CS168-50, "Polystyrene Plastic Wall Tiles, and Adhesives for Their Application," 1950.

CS173-50, "Heavy-Duty Alpha-Cellulose-Filled Melamine Tableware," 1950.

CS181-52, "Water-Resistant Organic Adhesives for Installation of Clay Tile," 1952.

CS192-53, "General Purpose Vinyl Plastic Film," 1953.

Simplified Practice Recommendations—

SPR242-51, "Vinyl-Coated and Pyroxylin-Coated Cotton Fabrics," 1951.

SPR249-52, "Plastic Tableware," 1952.

The Society of the Plastics Industry has committees working on the accumulation of technical data and the drafting of standards for other products, such as plastic pipe and reinforced plastics. This type of activity will become increasingly urgent as the industry grows and its products become major materials of construction in the building and industrial engineering fields.

## International Standards

The need for such standards on an international scale is becoming increasingly important because of the growth of world commerce in plastics. The United States, which produces more than half of the world's supply of plastics and exports a greater tonnage than any other country, has a vital interest in cooperating in the preparation of these international standards. A large, relatively untapped market for the industry exists within our own hemisphere in Central and South America, as evidenced by the increasing number of subsidiary companies being established there by U.S. chemical firms.

The International Standardization Organization has set up Technical Committee 61 on Plastics to prepare standard testing methods for use in international trade. This committee has held three meetings: 1951 in New York; 1952 in Turin, Italy; 1953 in Stockholm, Sweden. The next meeting is to be held in Brighton, England, in October 1954. Twelve countries were represented at the Stockholm meeting by 58 delegates, as follows: Belgium, 3; Denmark, 1; France, 5; Germany, 7; India, 1; Italy, 5; Netherlands, 4; Norway, 1; Sweden, 14; Switzerland, 2; United Kingdom, 9; and United States, 6. Six Draft Proposals of testing methods were approved at Stockholm;

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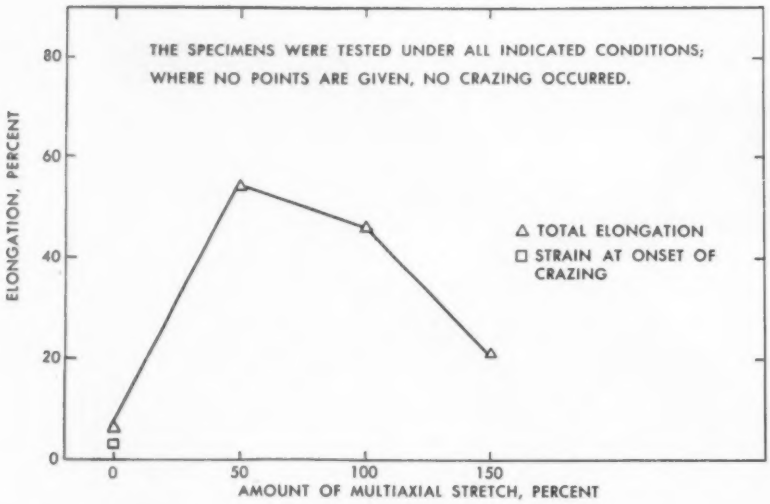
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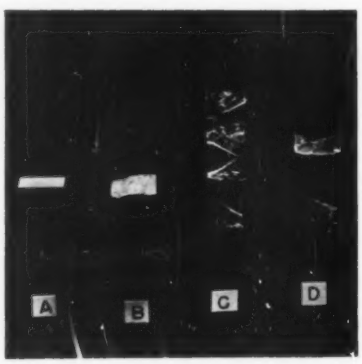



**Marked increases in elongation (and hence toughness) and resistance to crazing result from orientation of polymethyl methacrylate by multiaxially stretching the cast sheet**

these methods of test pertain to the determination of water absorption, apparent densities of molding powders (pourable and non-pourable from a funnel), acetone-soluble matter of phenolic moldings, flexural strength properties, and temperature of deflection under load. These properties are quite commonly included in specifications for molding compounds and plastic materials, and were among the first to be covered in the work on standardization of testing methods by ASTM Committees D-9 and D-20.

Progress was made on the international standardization of test methods for many other properties, of standard laboratory atmospheres and conditioning procedures for use in testing, and of nomenclature and listing of equivalent terms in various languages. Some of the other properties for which the Working Groups of ISO/TC 61 are drafting proposed international methods of test are methanol-soluble matter of polystyrene; percentage of free phenol, free ammonia, chlorides, and pH of water extract of phenolic moldings; tensile properties; flammability; impact strength; and flow properties of plastics.

The International Organization for Standardization (ISO) is made up of the national standardization organizations of about 35 countries. It has technical committees working in diverse fields of materials and products. The American Standards Association (ASA) is the Secretariat for ISO/TC 61 on Plastics and, in collaboration with ASTM Committee D-20, is responsible for scheduling and conducting the work of the plastics committee. The draft proposals prepared by ISO/TC 61 are circulated by ASA to the participating member bodies (13 in the case of ISO/TC 61) for consideration. When a draft proposal is approved by a majority of these organizations, it becomes a Draft ISO Recommendation and is submitted to all ISO member bodies for consideration.




**Fracture surfaces of unstretched and stretched polymethyl methacrylate and polymethyl alpha-chloroacrylate. A—unstretched polymethyl methacrylate; B—unstretched polymethyl alpha-chloroacrylate; C—modified polymethyl methacrylate stretched 45%; D—polymethyl alpha-chloroacrylate stretched 100%. Laminar structure imparted to plastic by stretching process is apparent at fracture surfaces of C and D**

When it is accepted by a majority of the ISO member bodies and the ISO Council, it becomes an ISO Recommendation; if accepted by all the ISO member bodies, it becomes an ISO Standard.

The importance of international trade in plastics to the American industry calls for continued and increasing participation in the efforts of ISO to provide clearly defined terminology and recommended methods. It is to the interest of the plastics organizations and firms of this country to continue to be represented on delegations as strong as those which have represented the United States at the first three meetings of ISO/TC 61 and to establish working relationships with their counterparts in other countries.

## A Plastics Institute

A dynamic program of research and engineering studies on plastics calls for industry cooperation and teamwork. The record of similar activities in other industries, such as textiles, paper, and leather, indicates that now is the appropriate time to plan and organize such an effort through an industry-supported plastics institute. Establishment of such an institution to serve as a source of basic technical information and to provide specialized training in plastics will be an important step forward toward the position of leadership among the industries of the United States, which is the role forecast for the plastics industry by the President's Materials Policy Commission and outstanding economists.

It is difficult to get comparative figures on the present relative positions of the textiles, paper, leather, and plastics industries in our national economy, but we can use the 1950 Census of Manufactures as a guide. These statistics show the following values for products shipped in these industries in 1950: textiles, $14 billion; paper, $4 billion; leather, $2 billion; plastics, $1.4 billion. The latter figure is arrived at by taking the value of $949 million for synthetic plastics produced by the chemical industry and adding to it $473 million for value added by manufacture of "plastics products, not elsewhere classified." This is probably a conservative estimate of the true relative position which the

(*To page* 221)

# *Wonderful way to handle kitchen tools!*



MELMAC *handles molded for Acc Products Company, Chalfont, Bucks County, Pa., by Northern Industrial Chemical Co., South Boston, Mass.*

## MELMAC® makes handles with a quality look and feel ...durable...resistant to heat, washing, discoloration!

Heat- and flame-resistant plastic handles are a sales feature of these new Ace and Luxor stainless steel kitchen tools. Molded of MELMAC melamine-formaldehyde—the same material used for molding beautiful, break-resistant dinnerware—these handles withstand washing in automatic dishwashers without distortion or loss of luster. And the more they are handled the better they are! The appearance of MELMAC actually improves with handling.

What's more, MELMAC gives handles a *quality look*. On these kitchen tools, for example, MELMAC handles are available in an attractive grained effect resembling walnut wood, a striated ivory MELMAC having the appearance of antique bone ivory, and jet black.

*Remember*—whenever you make a product that is to be handled, there's *no* surface like a MELMAC surface for appearance and durability! Interested in how MELMAC can help you handle *your* products better? We'll be glad to tell you more.

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# Physiological Activity of Fluorocarbon Polymers

by D. R. Hagemeyer* and Warren Stubblebine†

THE industrial potentialities of the new fluorocarbon polymers are well known. Their unusual chemical stability is unsurpassed by other organic materials. The very newness of these polymers precludes any published history on their physiological activity, particularly with respect to the conditions under which articles are fabricated from the bulk materials. Some references have been made in the trade literature and in manufacturers' bulletins to the necessity for adequate ventilation while processing the fluorocarbons but no specific data have been presented.

In an effort, therefore, to ascertain the magnitude of the toxicological problem believed to exist, the work described in this paper was performed. Because of the industrial importance of precise knowledge concerning toxicological hazards during processing of these materials, the conditions used were selected so that data along these lines could be obtained.

The entire group of accelerated tests was performed on three fluorocarbon polymers or blends thereof: Polymer A was polytetrafluoroethylene; Polymer B was polymonochlorotrifluoroethylene; and Polymer C consisted of Polymer B together with a plasticizer which was a lower molecular weight substance similar chemically to the polymer itself. The experiments consisted of the exposure of living organisms to the atmospheres generated when the polymers were handled in a manner similar to that required in commercial fabrication.

One phase of the work consisted of the exposure of standard cultures of *Staphylococcus Aureus, Staphylococcus Albus,* and airborne bacteria to the fluorocarbon vapors. A second phase involved the exposure of test animals, a colony of Dr. Webster's Swiss strain mice.

In the case of the bacteriological work, ordinary beef broth agar plate count techniques were employed with the customary controls. After exposure under each set of conditions, the plates were incubated for 24 hr. and a bacteriological count performed to determine the effects of the exposure to the fluorocarbon vapors. The results were recorded as showing "no effect," "decrease in rate of growth," and "destruction" of the organism.

The fluorocarbon atmosphere was generated in the manner shown in Fig. 1. The concentration of halide in the atmosphere was controlled by the temperature to which the polymer was heated and by the rate at which bacteriologically filtered air was introduced. The specific halide indicator was calibrated gravimetrically. Except for halide content, precise chemical constitution of atmosphere was not determined.

## Experiments with Bacteria

*Effect of halide concentration*—The first group of experiments consisted in the exposure of the inoculated plates for a definite period of

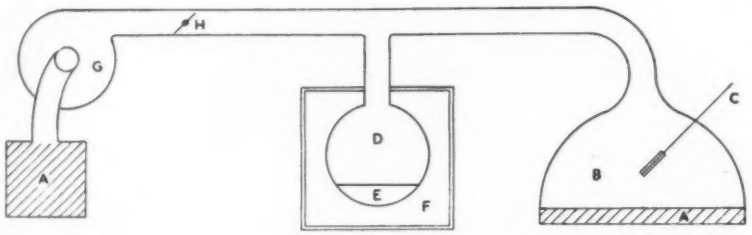



Fig. 1—Apparatus for exposure of organisms to fluorocarbon vapors. Letter designations indicate the following: A—bacteriological filter; B—exposure camera; C—halide indicator; D—polymer vapor; E—fluorocarbon polymer; F—oven; G—blower; H—control valve

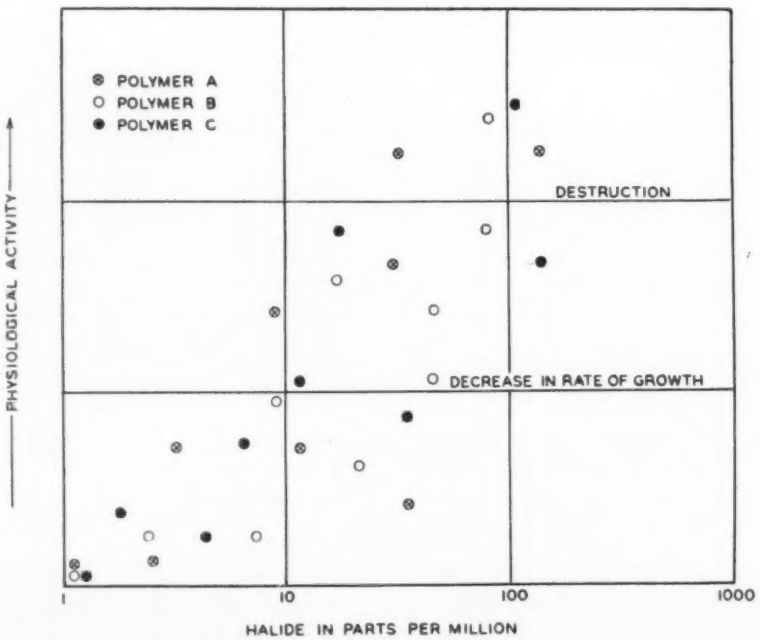



Fig. 2—Effect of 2-min. exposure of bacteria to fluorocarbon vapors at room temperature

*Quantum, Inc.
†The Connecticut Hard Rubber Co.

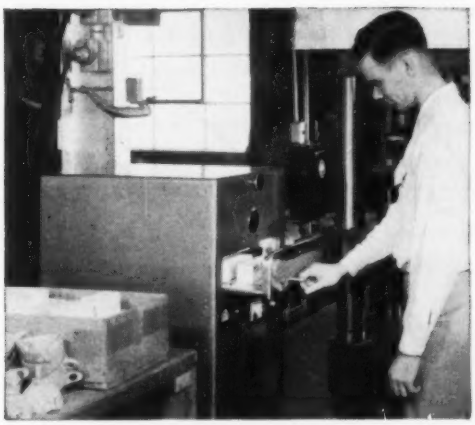


*Kenneth B. Welch, Pres. (left) and Roger R. Sacia, V. P., Kenro Corporation, discuss the uniform high quality of their "Holiday" dinnerware.*

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# "It gives us more for our money"

**Says KENNETH B. WELCH, *President***
**Kenro Corporation**



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PROGRESSIVE Kenro Corporation, Fredonia, Wisconsin . . . manufacturer of attractive, break-resistant "Holiday" dinnerware . . . expresses its enthusiasm for THERMEX* Plastics Preheaters in the words of its President, Kenneth B. Welch:

"After trying several makes of preheaters, we found the Girdler unit superior. We preferred it because it is designed better . . . more compact, easier to operate and its heating is even and dependable. We think it gives us more for our money."

On the basis of the tests, Kenro purchased a 3KW THERMEX Preheater in October, 1953 and another in December, 1953. Both units operate 18 hours per day, 5 days per week.

Find out how *you* can cut curing time and improve quality of products with THERMEX Dielectric Preheating Apparatus. Call or write The Girdler Company, Thermex Division, Louisville 1, Kentucky.

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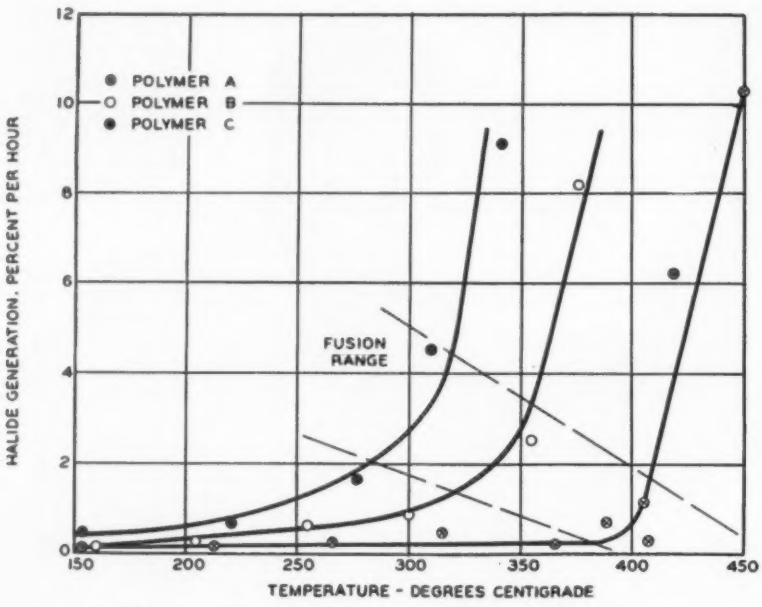



Fig. 3—Weight loss of fluorocarbon polymers heated for 2 hr. at various temperatures

time, at room temperature, to an atmosphere of known halide content. After incubation, counts were made and the data obtained are shown in Fig. 2. It was found that although three different groups of bacteria were used, there was no significant difference between their response to these atmospheres. The data are given, therefore, as though a single culture had been used. Each point in Fig. 2 represents the average of at least six cultures which had been exposed at the indicated concentrations for 2-min. duration. Under these conditions, there were no observable differences in the bacteriological activities of the vapors generated from the various polymers. A definite relationship was found to exist between the bacteriological activity of the polymer and its concentration in the vapor.

*Volatility of Polymers*—The effect of temperature on the volatility of the polymers was studied in the next group of experiments. The data obtained are presented graphically in Fig. 3. The total weight loss of the moisture-free samples heated for a 2-hr. period at the various temperatures is given. A marked increase in the amount of material volatilized occurred as the temperature for each polymer was increased through its fusion zone.

*Effects of Exposure Time and Halide Vapor Concentration*—A series of experiments were run to determine polymer activity at a given concentration for an extended time. Atmospheres with halide concentrations of 1, 10, and 100 p.p.m. were generated. Cultures were exposed for various definite periods of time in intervals up to 1000 minutes. The results are shown in Fig. 4. It was found that the activity of the polymer atmosphere with a cencentration of 1 p.p.m. was practically nil. At a concentration of 10 p.p.m., however, a decided effect was noted, while at 100 p.p.m. the effect was very pronounced. In those concentrations where physiological activity was noted, the activity was proportional to the time of exposure. Thus, the longer the continuous exposure to the breakdown vapors, the more serious becomes the physiological effects. The work reported was on the basis of continuous exposure for the times indicated. The effects of cycling between exposure and non-exposure with incubation periods between the two conditions was not studied.

The previous data seemed to indicate that a definite threshold with respect to physiological effects existed. Above this threshold value, the physiological activity appeared to be dependent upon both the concentration of the halide in the vapor and the total time of continuous exposure. In an effort to establish this relationship, a simple group of experiments were run which simulated conditions as they might exist in actual manufacturing operations with inadequate ventilation.

A closed system was constructed and so manipulated that only 20% of its atmosphere was changed with

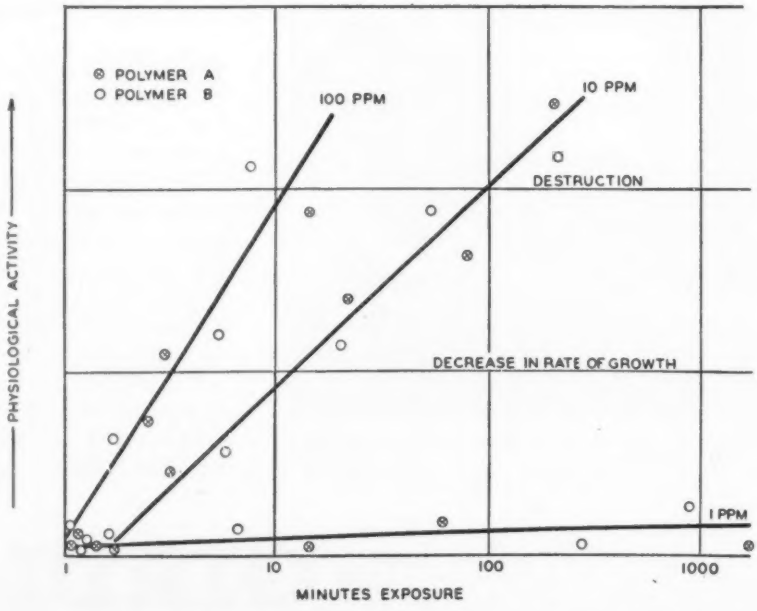
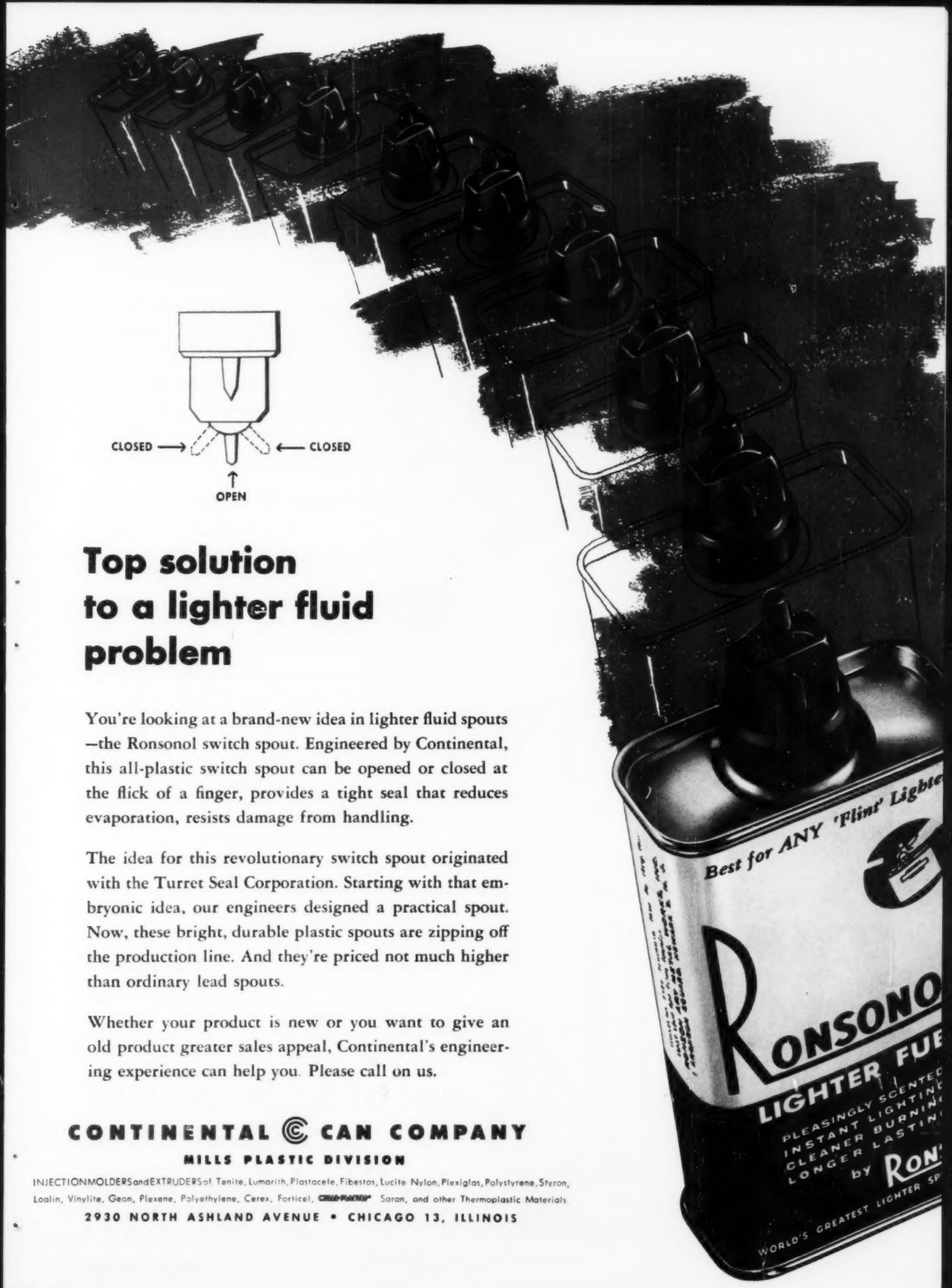



Fig. 4—Relationship between length of exposure (in minutes) of bacteria to fluorocarbon vapors of various concentrations (in p.p.m.) at room temperature




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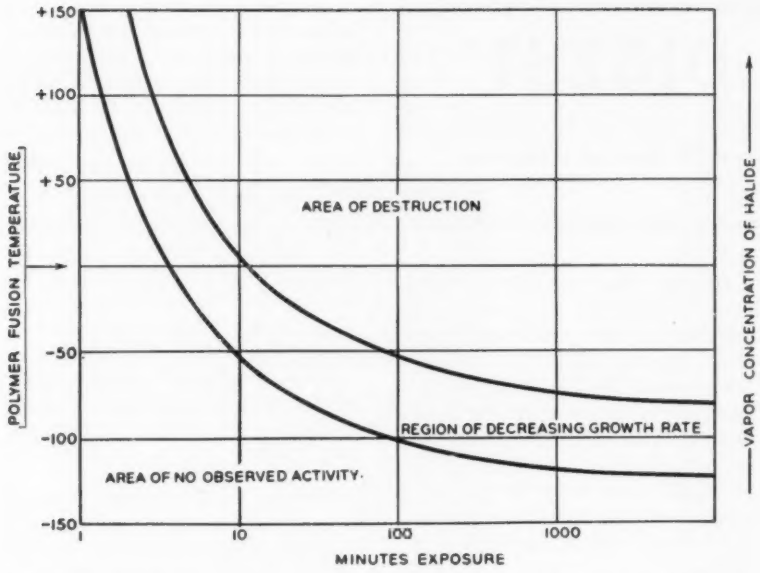



Fig. 5—Relation of polymer temperature to exposure time required for bacteria destruction

outside air each hour. Quantities of the various polymers were heated to the desired temperature within the chamber and exposures to bacteriological plates were made to the atmospheres for 2 min. at room temperature. In each case, the vapor was allowed to generate for at least 1 hr. prior to exposure.

This series of tests made under conditions of "poor ventilation" confirmed the previous work. The physiological activity of the vapors was found to be dependent upon the temperature to which the polymer is heated. The temperature determines the rate of vapor generation and the degree of change of atmosphere, or dilution, affects the concentration.

It was also found, as shown in Fig. 5, that for any particular atmosphere or area in which the ventilation characteristics are constant, there is a fairly definite relationship between the temperature at which the polymer may be held (i.e., the halide concentration) and the time within which bacteriological action can take place. The conditions are such, however, that there must be sufficient heated polymer for a long enough period of time to produce the halide concentrations shown.

## Experiments with Mice

Since the fluorocarbon vapors showed a high degree of activity from a purely bacteriological standpoint, it was decided to investigate the possible physiological activity of the vapors on a higher type of living organism. For this phase of the work, a colony of Dr. Webster's Swiss strain mice was selected for study. The work was not as extensive as that carried out with the bacteria but a sufficient number of experiments were carried out to warrant valid conclusions. Each run was made with six mice, properly controlled and on a standard diet. Upon the completion of each experiment, autopsies were performed on each. The equipment used was the same as that described previously.

Figure 6 shows the data obtained when various groups of mice were exposed for a single period of time to an atmosphere of 100 p.p.m. of halide concentrations. The factor "Hours to Destruction" is described as the period of time elapsed after respiratory exposure until death occurred. Substantial variations were present even within these average values. A definite relationship was found to exist, however, between the time of exposure to the atmosphere and the resulting period of time until death took place.

In two additional respiratory experiments at 1000 p.p.m. halide concentration, with a 30-sec. exposure time, death of the mice occurred within 10 min. of the exposure.

In view of the fact that the physiological activity of the 100 p.p.m. halide concentration was severe, the halide content was reduced to 10 p.p.m. and mice were exposed to this atmosphere for one continuous exposure period of 30 minutes. There appeared to be no immediate effects and after 4 days elapsed time there were no abnormalities. Hence a single exposure to a concentration of 10 p.p.m. of halide could not be considered particularly hazardous. However, when a group of mice

(*To page* 219)

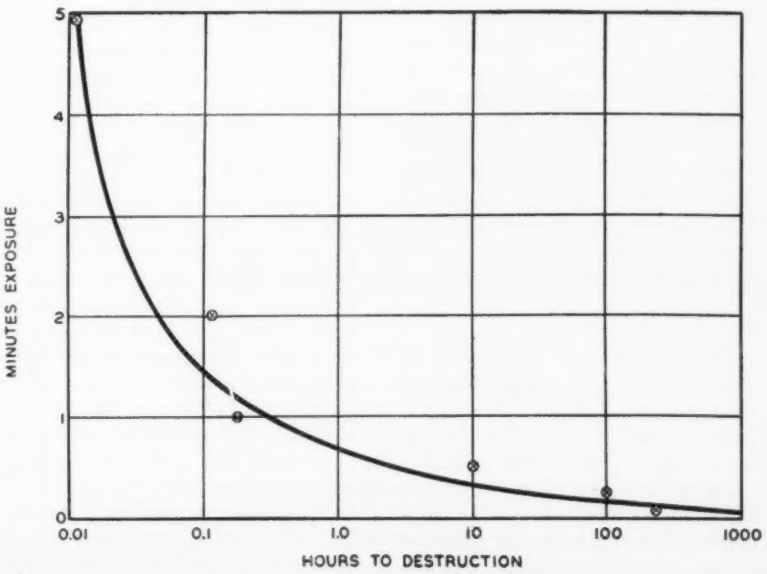



Fig. 6—Effect of exposure of mice to 100 p.p.m. of fluorocarbon vapors

# PLASTICS DIGEST*

**Abstracts from the world's literature of interest to those who make or use plastics or plastics products. Send requests for periodicals to the publishers listed.**

## General

RAW MATERIALS PROBLEMS IN THE SYNTHESIS OF PLASTICS. H. Meis. Kunststoffe *44*, 6-7 (Jan. 1954). A few examples show the line of development of the raw materials supply for plastics synthesis. The first source was coal tar; large quantities of phenol, in addition to that occurring naturally in coal tar, are now produced synthetically. This was followed by acetylene, forming the basis for vinyl compounds. Currently, petroleum byproducts are serving increasingly as the chemical raw materials for plastics.

## Materials

POLYSTYRENE FOAM. R. N. Kennedy. SPE J. *9*, 11-12 (Dec. 1953). The properties, handling characteristics, and applications of expanded polystyrene are discussed. This material is produced in a density range of 1.3 to 2.0 lb./cu.ft. and the strength properties vary with the density. The thermal conductivity compares favorably with that of other commercially available board form insulating materials. Polystyrene foam has excellent water-resistant properties and its electrical properties more nearly approach those of air than any solid material. Its chemical resistance is almost like that of polystyrene and it can be fabricated by most woodworking techniques. The basic fields consuming the major amounts of foam are low-temperature insulation, floral, display and novelty, and buoyancy.

LIQUID POLYMERS COMBINED WITH EPOXY RESINS. J. S. Jorczak and J. A. Belisle. SPE J. *10*, 23-29, 38 (Feb. 1954). Coreaction of epoxy resins with polysulfide liquid polymers results in products having many properties better than either polymeric product by itself. When these two materials are combined, a wide range of properties can be had by selection of the concentration of the two ingredients. The polysulfides when used as modifiers for epoxy resins contribute lower shrinkage, lower strain, greater and permanent flexibility, much higher impact resistance, lower moisture vapor transmission, lower pouring viscosity, and better peel strength in adhesion. The modified epoxy resins are advantageous in casting and embedding applications, in adhesives, and in laminates.

A NEW RANGE OF EXPANDED RESINS. D. N. Hunter. Plastics (London) *19*, 58-59 (Feb. 1954). A range of resins that expand due to combination with an agent are described. Thermosetting resins are used, together with an expanding agent that liberates nitrogen by actual combination with the resin during the curing process. The gel point is coincident with the point of maximum expansion. The techniques for using these resins are discussed.

CATION EXCHANGE MATERIALS FROM COTTON AND POLYVINYL PHOSPHATE. G. C. Daul, J. D. Reid, and R. M. Reinhardt. Ind. Eng. Chem. *46*, 1042-45 (May 1954). Polyvinyl phosphate was prepared by several methods using phosphorus oxychloride, phosphorus pentoxide, orthophosphoric acid, and urea-phosphate. All except the latter gave mixed esters containing singly, doubly, and possibly triply bound phosphorus and most of these treatments gave products that were either water-insoluble or only partially soluble. The urea-phosphate treatment gave a completely water-soluble product with a high content of substantially singly bound phosphorus. Insoluble polyvinyl phosphate may be used as an effective cation exchange resin with capacity equivalent to that of the commercial resins. The soluble polyvinyl phosphate may react with cotton and/or be condensed on cotton cloth to give a convenient cation exchange material with high capacity. With equivalent strength losses, four times as much phosphorus can be fixed on the cotton with the urea-polyvinyl phosphate as with the urea-phosphate treatment. The soluble compound can also be made to condense on such substances as nylon, cellulose acetate, and glass fibers.

MATERIALS FOR HIGH-TEMPERATURE SERVICE. H. R. Clauser. Materials & Methods *39*, 117-32 (Apr. 1954). The properties of materials commonly used at temperatures above 300° are surveyed. Metals, ceramics, and plastics are considered. The plastics include phenolic laminates, polyester laminates, silicone laminates, Teflon, and Kel-F.

BLENDS OF POLYVINYL CHLORIDE WITH RUBBERS. W. J. Smith. India Rubber World *129*, 785-86 (Mar. 1954). The acrylonitrile-butadiene copolymers, or nitrile rubbers, are by far the most commonly used elastomers for plasticizing polyvinyl chloride polymers or copolymers. However, other rubbers such as GR-S, polyisobutylene, and substituted acrylonitrile-butadiene copolymers have also been used. In general, nitrile rubbers with medium acrylonitrile content, in the range of 30 to 37%, are the most useful for plasticization of the vinyl chloride resins. Nitrile-rubber-plasticized vinyl chloride resins are characterized by excellent retention of flexibility and impact resistance after prolonged or repeated contact with oils, greases, and aliphatic hydrocarbons in general, or prolonged exposures to elevated temperatures. Among the less desirable characteristics of these compounds have been the relatively poor resistance to light aging, the low plasticizing efficiency of the nitrile rubber as compared with liquid plasticizers, and the processing problems encountered. Applications include wire and cable insulation, upholstery sheeting, packaging film, and tubing.

RESIN-RUBBER RIGID BLENDS. A SUMMARY. A. J. Urbanic. India Rubber World *129*, 787-78 (Mar. 1954). The addition of a rubber to a resin usually results in increased impact strength, flexibility, elongation, and hot tear strength of the resins and lowering of the processing temperature. On the other hand, other effects include decreased heat distortion, hardness, tensile strength, and

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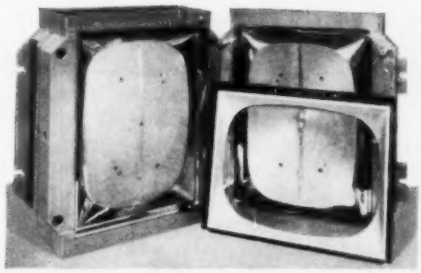
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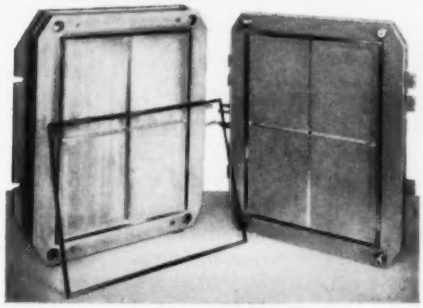
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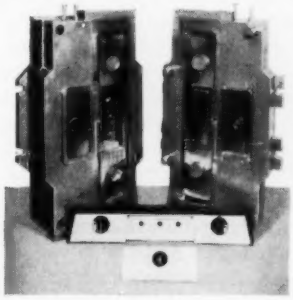
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weathering properties, and poorer flow properties. These effects usually increase with increased rubber content. The properties will also vary with the type of rubber used; a certain amount of compatibility must exist between the two phases to get a satisfactory product. The most important methods of preparing resin-rubber rigid mixtures include Banbury mixing, mill mixing, latex mixing followed by coagulation or spray drying, and ribbon blending of powdered resin and powdered rubber and of powdered resin and liquid rubber. Several resin-rubber blends of potential importance are discussed briefly.

## Molding and Fabricating

EXTRUSION PRACTICE IN EUROPE. E. Davey-Turner. SPE J. *10*, 18-22, 41, 42 (Feb. 1954). The status of the extrusion industry in Europe is discussed. One very effective factor in the progress of the extrusion industry is the practical cooperation between the equipment manuacturers and the user. This has led to many improvements in extrusion machinery. A wide variety of intricate sections, both hollow and solid, are being produced from many plastics by extrusion. Vinyl sheeting is being produced, embossed, and backed with a textile material in the same extrusion operation. There is great interest in the production of blown polyethylene film and flat polyethylene sheet. A new patented flat die is described for extruding sheet, replacing the conventional circular die. Also, the method of operation of a two-screw extruder for large-bore thick-walled polyethylene tubing is described.

COLLAPSIBLE DRY BOX OF FLEXIBLE PVC SUPPORTED IN A STEEL FRAME. R.A.G. Welsher. Gt. Brit. A.E.R.E. Report E/M-78, 6 pp. (Dec. 9, 1953). A method of constructing a dry box from flexible polyvinyl chloride plastic with suction unit, supported by a tubular steel frame is described, together with a collapsing technique for storage or disposal.

## Applications

VACUUM FORMED PLASTICS. Modern Packaging *27*, 108-13, 198, 200, 202-04, 206 (Feb. 1954). Vacuum forming of plastic sheet materials presents new opportunities in the field of transparent, contour-shaped, throw-away packages, as well as in the field of three-dimensional, low-cost displays. Vacuum formed plastics fill the gap between the low-cost film wrap or bag and the more costly formed rigid or semi-rigid plastic container. The chief advantages of the method are: considerably thinner side walls can be produced than can be achieved by injection molding or extruding; unusual profiles and intricate shapes can be handled; the piece to be molded can be preprinted; containers and designs can be pretested because of the low costs involved; single pieces or smaller multiple shapes can be fabricated from a single sheet. Some of the possible applications discussed in detail are: contour- or profile-shaped transparent containers; transparent domes or covers for carded merchandise; platforms, trays, holders, box lids and other package components; displays and replicas of trademarks, packages, products, and emblems. The sheet materials generally used include cellulose acetate butyrate, cellulose acetate, polystyrene, and vinyl chloride polymers and copolymers.

THREE-DIMENSIONAL NAMEPLATES. A. B. Glanvill. Plastics (London) *19*, 35-37 (Feb. 1954). The various types of plastic nameplates in general use are described. Design considerations are discussed as well as methods for applying finishes and methods of mounting the nameplates.

NEW EXPANDABLE POLYSTYRENE CAN BE MOLDED. Materials & Methods *39*, 106-09 (Apr. 1954). The properties, methods of joining and fabricating, molding procedures, and possible applications of a new expandable polystyrene plastic are described.

REDUX BONDING SAVES $$ AT CHANCE VOUGHT. G. B. Ashmead. Aviation Age *21*, 20-21 (Apr. 1954). The bonding of aircraft parts with a modified phenolic adhesive is described. Preassembly, bonding operations, quality control, shear strength checks, and inspection are discussed.

POLYAMIDES IN ENGINEERING. H. Zickel. Kunststoffe *43*, 562-64 (Dec. 1953). Polyamides possess such toughness, wear-resistance, and vibration-damping properties that they are used wherever sliding friction occurs and noiseless running is required. Their very low coefficient of friction, whether they are used dry or with a lubricant, stamps them as an ideal material for bearings and gear-wheels. They are supplied in rod form for the machining of parts and as complete injection-molded parts where larger numbers are demanded. Machining is similar to that of light alloys.

SARAN FILM TODAY. F. C. Dulmage, Jr. Modern Packaging *27*, 117-21 (Apr. 1954). The properties and applications of saran film are summarized.

## Coatings

NEW ACRYLIC RESIN DISPERSIONS IN WATER-DISPERSED PAINT SYSTEMS. N. J. Timmons. Paint & Varnish Production Clubs Official Digest No. 347, 921-26 (Dec. 1953). Most conventional paint films dry by a process of oxidation or polymerization, which does not cease when the film reaches its most desirable properties but continues with ultimate embrittlement, discoloration, and loss of adhesion of the film. Acrylic type esters are among a group of materials that do not require oxidation to produce useful films. They can be polymerized completely in emulsion form, so that no further polymerization can occur after application. Acrylic resin dispersions are exceptionally stable in both emulsion and dried-film form. The emulsion can be boiled or frozen without coagulation, is not coagulated by soluble salts, and has excellent mechanical stability. As a paint vehicle, acrylic resin dispersions give adequate emulsion viscosity without the addition of thickening agents. The dried film shows excellent resistance to extraction by water, has tremendous scrub and abrasion resistance, exhibits outstanding resistance to ultra-violet light, is completely free from odor, does not soften or discolor in contact with oils or greases, and remains permanently flexible because it contains no plasticizer to be volatilized or leached out.

MECHANISM OF DRIER ACTION. PROPOSAL. E. R. Mueller. PANEL DISCUSSION. W. O. Lundberg, F. M. Greenawald, F. Scofield, and E. B. Fitzgerald. Ind. Eng. Chem. *46*, 562-72 (Mar. 1954). The probable mechanism of the action of drier metals in paint and oil films is discussed in light of the most recent and now fairly well established theories for

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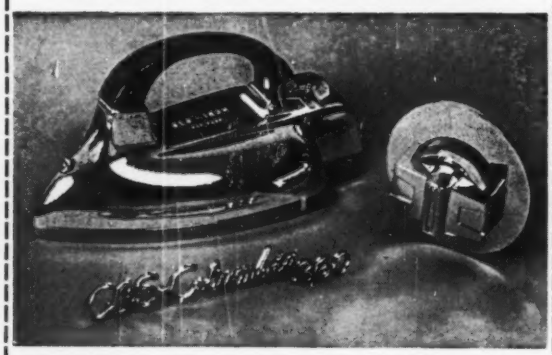
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the manner in which drying oils and air-drying finishes gel or "set." A brief review of peroxidation and polymerization mechanisms for drying oils and air-drying finishes, including the probable role of the drier metals in these mechanisms, is given. Experimental work on several air-drying varnishes is presented. The maximum infra-red absorption in the 2.9-micron band is greatest up to the "set" time. Moreover, if this is correlated with the ultra-violet and peroxide-development data of other workers, there appears to be good agreement between peroxide development, induced conjugation, and peroxide decay. When two "optimum" driers are used which differ considerably in composition but produce the same over-all drying times, the infra-red data almost exactly superimpose each other. This is taken as evidence that the mechanism of the action of these driers is similar at 30° C. It is postulated that an important role of the driers is to initiate peroxidation so that autoxidation can proceed. It is theorized that certain active drier metals—e.g., cobalt—may initiate reaction chains in addition to promoting peroxide decomposition and free-radical chain formation. The concentration of driers is significant until a level is reached to obtain maximum speed of peroxide development. Several mechanisms by which driers may help produce free radicals are presented. A discussion of this proposal points up the fact that there may be no single simple mechanism of drier action. Observations of the action of cobalt as a destroyer of peroxides and hydroperoxides are made. The physical effects of driers, observed phenomena that can be explained only by consideration of physical processes, are discussed. It is concluded that the work presented represents a challenge for future workers and offers leads for further study of drying oil oxidation.

## Properties

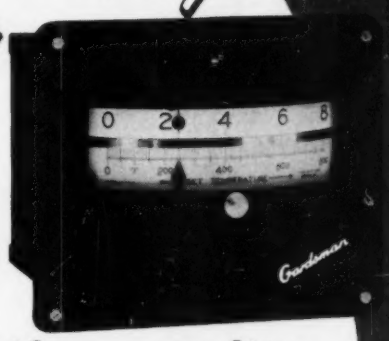
THERMAL DEGRADATION OF POLYMERS DURING MOLDING. PART I. THEORETICAL CONSIDERATIONS. H. L. Frisch and V. T. Stannett. SPE J. *10*, 16-17 (Jan. 1954). In injection molding, a part of the charge in the cylinder consists of material heated in the course of the previous operation of the mold. Equations are derived for the calculation of the amount of


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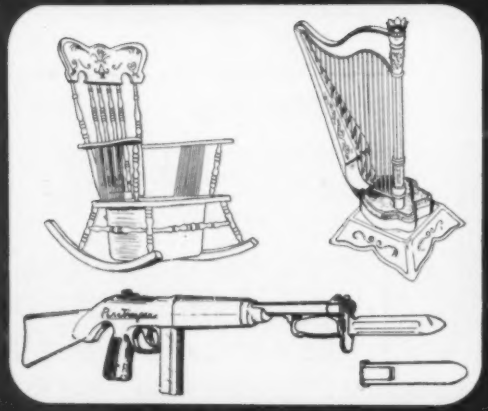
residue material remaining after a given number of molding cycles. It is shown that the amount of this degraded material in the charge is asymptotically a function only of a fraction of previously heated material and the kinetic rate law of the thermal degradation. The extent of degradation is presented for the case of first and zero order kinetics.

MECHANICAL PROPERTIES OF POLYETHYLENE. R. H. Carey. SPE J. *10*, 16-21, 41-42 (Mar. 1954). A number of methods for describing the mechanical properties of polyethylene are discussed. Data were obtained in short-time tensile and torsion tests on polyethylene resins of several different molecular weights over a wide range of temperatures. In addition, results are presented for tensile tests conducted on molded specimens immersed in seven fluid environments, for creep tests, and for stress corrosion–rupture tests of hydrostatically inflated pipe samples, all at room temperature. All of the data show that the tensile strength and final elongation are of limited significance. Short-time static tests show that under polyaxial stress conditions, the yield point is the primary criterion for failure. Long-time strength tests, the "elastic limit" in short-time tests, and data from stress corrosion–rupture tests qualitatively indicate maximum engineering design stress of $\frac{1}{3}$ or $\frac{1}{4}$ of yield point. At present, these criteria apply only to room temperature; there is no long-time stress information at elevated temperatures.

DEGRADATION OF CELLULOSE BY IONIZING RADIATION. A. Charlesby. Gt. Brit. A.E.R.E. Report M/R-1342, 8 pp. (Jan. 21, 1954). When subjected to the effect of ionizing radiation, such as atomic pile radiation or gamma radiation, cellulose is rapidly degraded into a powdery material. A theoretical treatment shows that if the effect of radiation is to cause facture at random in the main chain, the relation between intrinsic viscosity $[\eta]$ and radiation dose R should be of the form $\log [\eta] = -a \log (R + R_o) +$ constant, where $R_o$ is a virtual radiation dose needed to produce the initial number average molecular weight from a chain of infinite molecular weight. The published data of Saeman, Millett, and Lawton were used to verify this formula, which leads to the following relationship between $[\eta]$ in cuprietylenediamine and viscosity average molecular weight ($M_v$): $[\eta] = KM_v^a$, where $a = 0.71$. The constant K has been evaluated by comparison with data given by Gralen, but is less accurately known. It is shown that one million röntgen results in fracture of 0.16% of the monomer units in the main chain. The decomposition of carbohydrates under radiation, which occurs at the same time as main chain fracture, can be explained on the assumption that approximately one monomer unit is decomposed per main chain fracture. The study of intrinsic viscosity of irradiated polymers appears to offer an accurate means of evaluating *a* in the usual formula for intrinsic viscosity $[\eta] = KM^a$.

EVALUATION OF POLYETHYLENE CROSSLINKED BY IONIZING RADIATION. D. S. Ballentine, G. J. Dienes, B. Manowitz, P. Ander, and R. B. Mesrobian. J. Polymer Sci. *13*, 410-14 (Apr. 1954). The effects of ionizing radiation on the physical properties of polyethylene are reported;

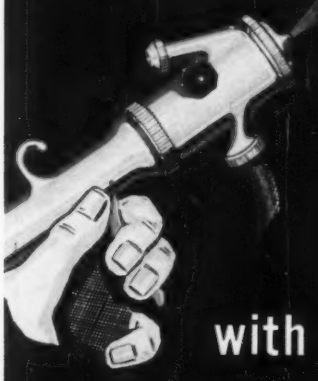

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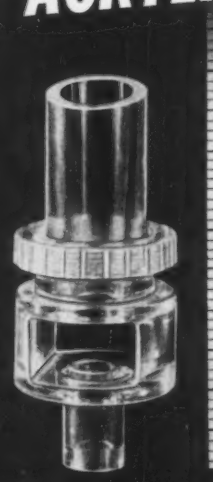
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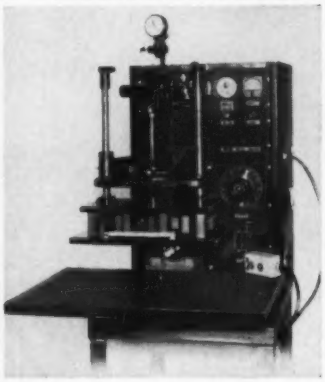
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it is quite evident from the heat distortion measurements that cross-linkage by exposure to γ—radiation imparts pronounced heat stability to the polymer. On the other hand, the ultimate elongation of the polymer drops considerably with irradiation while tensile strength exhibits a smaller but definite decrease. It is evident that any commercial utilization of the modified polymer will require a suitable balance between the improved heat distortion properties and the deleterious changes in elongation and tensile properties.

Arcing Tests on Plastics. T. J. Martin and R. L. Hauter. SPE J. *10*, 13-15, 39, 42 (Feb. 1954). A new technique was developed for testing the arcing resistance of materials in the presence of sustained electrical arcing simulating a circuit failure. This method differs from the A.S.T.M. test method and the results do not necessarily agree with those obtained by the A.S.T.M. test method. The following materials were tested, listed in ascending order of arc resistance: phenolic, modified phenolic, mineral-filled polyester, glass-filled polyester, glass-fabric-reinforced epoxy, wood-flour-filled melamine, mineral-filled melamine, polytetrafluoroethylene, and glass-bonded mica.

Separation of Gases by Plastic Membranes. Permeation Rates and Extent of Separation. D. W. Brubaker and K. Kammermeyer. Ind. Eng. Chem. *46*, 733-39 (Apr. 1954). Data on permeability of four plastic membranes to helium, hydrogen, oxygen, nitrogen, carbon dioxide, ammonia, and sulfur dioxide were obtained. The plastic films included in this study were polyethylene, polymonochlorotrifluoroethylene, a copolymer of polyvinyl chloride with polyvinyl acetate, and cellulose acetate butyrate. Most of the gas permeabilities increased exponentially with an increase in temperature. However, two cases were observed in which this relationship did not exist, that is, the slope of the line resulting from a plot of the logarithm of the permeability constant versus the reciprocal of the absolute temperature did not have a constant value. This anomalous behavior was attributed to the complexity of the permeability constant. A nonexponential variation of either the diffusion constant or the solubility coefficient with the temperature could be responsible for this behavior. Separation data obtained with mixtures of gases and such vapors as carbon dioxide, sulfur dioxide, or ammonia agreed remarkably well with the calculated values based upon experimental permeability data. For purposes of calculation, equations were derived on the basis of complete mixing on each side of the membrane, which may be used with considerable confidence for binary and multicomponent systems over a rather wide range of pressures and temperatures. These results are in contradiction with those reported by Weller and Steiner who found laminar flow conditions to exist. These equations represent a theoretical expression based upon simplifying assumptions. On the basis of the experiments, the plastic membranes were efficient nonporous media for gas separation.

Separation of Gases by Plastic Membranes. New Diffusion Cell Design. J. O. Osburn and K. Kammermeyer. Ind. Eng. Chem. *46*, 739-

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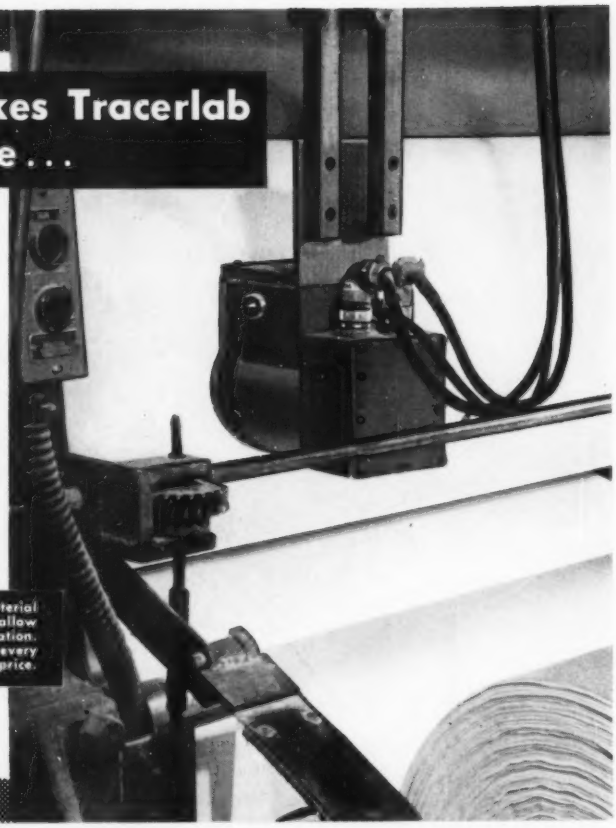
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42 (Apr. 1954). If separation of gases by diffusion through plastic film is to be used widely, new types of equipment to increase the ratio of film surface to equipment volume must be developed. A new design, which has certain advantages, has been tested. The operation of a model built according to this design indicates some promise for future development in the area of gas separation by the use of plastic film.

## Testing

IDENTIFICATION OF POLYHYDRIC ALCOHOLS IN POLYMERIC ESTERS. J. F. Shay, S. Skilling, and R. W. Stafford. Analytical Chem. 26, 652-56 (Apr. 1954). By a modified saponification procedure, the polyhydric alcohol fraction of a polyester resin can be separated. The component alcohols can be identified by infra-red spectral analysis, using the spectra of commercial alcohols as comparative standards. The method provides an effective means of identification for individual polyhydric alcohols and for binary mixtures.

IDENTIFICATION OF DICARBOXYLIC ACIDS IN POLYMERIC ESTERS. R. W. Stafford, J. F. Shay, and R. J. Francel. Analytical Chem. *26*, 656-61 (Apr. 1954). The diethyl esters of eight selected dicarboxylic acids were prepared and purified. Various physical properties were determined on the purified products; the potential applicability of these properties to the analysis of mixtures of esters was evaluated. The resolution of mixtures was found possible by the application of distillation and/or ultra-violet and infra-red spectroscopy. The dipotassium salts were prepared from the diethyl esters, and the Kappelmeier procedure was evaluated in the process. As characteristic derivatives, the salts were found to be less applicable to the identification of the acids than were the esters.

## Chemistry

RATE CONSTANTS FOR POLYMERIZATION REACTIONS. H. W. Melville and G. M. Burnett. J. Polymer Sci. *13*, 417-26 (May 1954). The rate constants for polymerization reactions are tabulated. This is a report to the Macromolecular Commission of the International Union of Pure and Applied Chemistry. 35 references are cited.

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# U. S. PLASTICS PATENTS

**Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.**

RESIN. T. White and J. R. B. Hastings (to Forestal Land, Timber, and Railways). U. S. 2,674,591, Apr. 6. Ketone-aldehyde resins containing sulfonic acid groups.

COPOLYMERS. E. W. Gluesenkamp and G. E. Ham (to Chemstrand). U. S. 2,674,592, Apr. 6. Fiber-forming copolymers of acrylonitrile and isopropenylpyridines.

VINYL CHLORIDE. F. E. Condo and J. R. Vinograd (to Shell). U. S. 2,674,593, Apr. 6. Production of polyvinyl chloride.

INSULATION. P. O. Nicodemus (to General Electric). U. S. 2,674,648, Apr. 6. Magnet wire insulated with methyl acrylate copolymer.

HEAT SEALING. N. Langer. U.S. 2,675,054, Apr. 13. Machine for continuously heat-sealing thermoplastic sheet.

STRIPPING FILM. C. F. Smith (to Eastman Kodak). U.S. 2,675,317, Apr. 13. Resinous photographic silk-screen stripping film.

PLASTICIZER. C. E. Dill (to Patent and Licensing). U.S. 2,675,325, Apr. 13. Tall-oil resin fraction.

PLASTICIZER. W. M. Gearhart (to Eastman Kodak). U.S. 2,675,327, Apr. 13. Trichloroethyl phosphate.

RESINS. L. P. Rankin and C. J. Seiler (to Carbide and Carbon). U.S. 2,675,335, Apr. 13. Resinous copolymer of different phenols and formaldehyde.

RESINS. J. T. Stephan (to Monsanto). U.S. 2,675,336, Apr. 13. Phenolic resin containing redwood bark.

PLYWOOD. D. S. Phillips (to American Cyanamid). U.S. 2,675,338, Apr. 13. Postforming plywood.

ADHESIVES. H. Zenftman (to Imperial Chemical). U.S. 2,675,339, Apr. 13. Polymeric aromatic phosphoric ester adhesives for polyethylene.

ION EXCHANGE. H. J. Schneider (to Rohm and Haas). U.S. 2,675,359, Apr. 13. Weakly basic ion-exchange resins.

POLYMERIZATION. T. Shusman (to Monsanto). U.S. 2,675,362, Apr. 13. Mass polymerization of styrene.

COATING. R. R. Howard and H. M. Wilcox (to R. M. Hollingshead). U.S. 2,675,363, Apr. 13. Vinyl chloride-vinyl acetate-maleic acid tripolymer atomized aluminum coating.

POLYMER. R. C. Harrington, Jr. (to Eastman Kodak). U.S. 2,675,364, Apr. 13. Acrylonitrile polymer solutions containing morpholine derivatives.

POLYETHYLENE. J. C. Pullman (to American Cyanamid). U.S. 2,675,366, Apr. 13. Polyethylene stabilized with a 2,2′-methylene bis(4,6-dialkyl phenol).

RESINS. P. H. Scrutchfield (to American Cyanamid). U.S. 2,675,369, Apr. 13. Aniline resins cross-linked with a diurethane.

POLYMERIZATION. G. R. Barrett (to Monsanto). U.S. 2,675,370, Apr. 13. Continuous polymerization.

POLYMERS. H. W. Coover, Jr. and

POLYMERIZATION. H. W. Coover, Jr. and J. B. Dickey (to Eastman Kodak). U.S. 2,675,372, Apr. 13. Polymerization of vinyl compounds. J. B. Dickey (to Eastman Kodak). U.S. 2,675,371, Apr. 13. Polymers of alpha-sulfo and sulfonamido-methyl acrylates.

LAMINATING. J. Pasquale (to Liberty Machine). U.S. 2,675,852, Apr. 20. Plastic laminating machine.

SILOXANES. A. J. Barry and D. E. Hook (to Dow-Corning). U.S. 2,676,091, Apr. 20. Powdered siloxanes.

SAND CORES. J. M. Fuller and T. H. Walton (to Masonite). U.S. 2,676,108, Apr. 20. Foundry sand core binder comprising reaction products of pentosans from lignocellulose with maleic anhydride.

SHEET MATERIAL. J. J. Thomas (to S. D. Warren) U.S. 2,676,118, Apr. 20. Production of casting support for thermoplastic sheet.

POLYETHYLENE. T. F. Banigan and A. F. Chapman (to Du Pont). U.S. 2,676,120-1, Apr. 20. Polyvinyl acetate surface treatment for polyethylene.

DUCT. O. A. Hansen (to Northrup Aircraft) U.S. 2,676,127, Apr. 20. Phenolic-resin-impregnated glass-fabric neoprene tape composite.

FOAMED RESINS. I. L. Newell (to United Aircraft). U.S. 2,676,157, Apr. 20. Foamed polyisocyanate modified alkyds.

PHENOLIC RESINS. M. M. Renfrew (to General Mills). U. S. 2,676,158, Apr. 20. Mixed esters of phenolic resins.

POLYMER. A. Cresswell (to American Cyanamid). U. S. 2,676,161, Apr. 20. Polymers of acrylonitrile and a cyanomethyl ester.

COATING. R. Marotta (to Monsanto). U. S. 2,676,162, Apr. 20. Fire-retardant epichlorohydrin resins containing condensates of phosphoryl chloride and ammonia.

SILOXANES. J. L. Speier (to Dow Corning). U. S. 2,676,163, Apr. 20. Siloxane polymers.

NYLON FABRICS. W. Charlton and E. C. Rutter (to Imperial Chemical) U. S. 2,676,164, Apr. 20. Nylon fabric coated with polyester resins.

POLYMERS. E. M. Fettes (to Reconstruction Finance). U. S. 2,676,165, Apr. 20. Polysulfide polymers.

POLYMERS. V. J. Webers (to Du Pont). U. S. 2,676,166, Apr. 20. Polymeric quaternary ammonium compounds.

SILOXANES. W. H. Doudt and L. J. Tyler (to Dow Corning). U. S. 2,676,182, Apr. 20. Copolymeric siloxanes.

MOLDING. J. F. Shannon. U. S. 2,676,357, Apr. 27. Molding conversion attachment for reciprocating presses.

BINDERS. C. E. Emmer (to General Binding). U. S. 2,676,360, Apr. 27. Production of curled plastic binders.

MOLDING. P. J. Heiden, H. Staggenburg, C. E. Tice, and E. G. Richardson (to General Motors). U. S. 2,676,368, Apr. 27. Casting machine.

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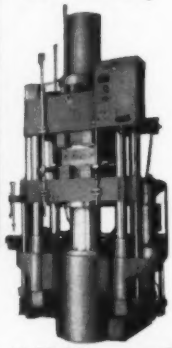
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O. G. R. Ferguson (to Laminex). U. S. 2,676,729, Apr. 27. Reinforced laminated molded receptacle.

COATING. A. E. Budner (to S. C. Johnson). U. S. 2,676,893, Apr. 27. Coating for wood consisting of a wax, dimethylpolysiloxane, and a solvent.

WRAPPING. B. L. Trillich (to Munising). U. S. 2,676,897, Apr. 27. Self-sealing vinyl chloride coated paper.

REINFORCED PLASTICS. C. J. Folger and R. M. Roberts (to Owens-Corning). U. S. 2,676,898, Apr. 27. Method of treating glass fiber bats with resin.

CELLULAR RESINS. J. L. McCurdy and L. Kin (to Dow). U. S. 2,676,927, Apr. 27. Non-flammable cellular plastics.

CELLULAR PLASTICS. R. L. Frank (to Ringwood Chemical). U. S. 2,676,928, Apr. 27. Foamed polyvinyl chloride.

POLYETHYLENE. J. C. Duddy (to Electric Storage Battery). U. S. 2,676,929, Apr. 27. Blends of fine starch and polyethylene.

POLYETHYLENE. G. L. Deniston (to Commonwealth Engineering). U. S. 2,676,932, Apr. 27. Flame-sprayable polyethylene.

COPOLYMERIZATION. G. E. Serniuk and J. D. Garber (to Standard Oil). U. S. 2,676,933, Apr. 27. Low-temperature copolymerization of olefins, diolefins, and aromatic compounds.

WAX COMPOSITIONS. J. M. Butler (to Monsanto). U. S. 2,676,934, Apr. 27. Wax composition containing styrene-maleic anhydride copolymer.

COPOLYMERS. B. F. Clark (to Du Pont). U. S. 2,676,938, Apr. 27. Ammonium salt of a copolymer of vinyl acetate and crotonic acid.

RESINS. H. J. Hahn and O. Horn (to Farbwerke Hoechst Aktiengesellschaft vormals Meister Lucius und Bruning). U. S. 2,676,939, Apr. 27. Stabilized polyvinyl acetals.

POLYMERS. A. S. Kenyon (to Monsanto). U. S. 2,676,940, Apr. 27. Halogen-containng polymer of an ethylenic alcohol.

PLASTICIZER. C. E. Rehberg (to U. S.). U.S. 2,676,941, Apr. 27. Vinyl chloride polymer plasticized with alkyl carbonates of glycol lactates.


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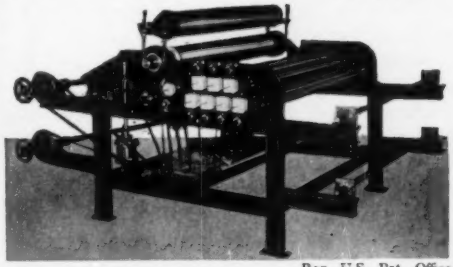
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LIBERTY's Combined Embossing-Polishing and Laminating Unit, which uses clean, even, controllable electric heating, is a production man's dream-come-true.

It is designed for non-stop operation, having both dual let-off and take-up stands. Pressure is infinitely adjustable to suit the roll being used, by air pneumatic pistons, each individually controlled. The unit runs at 6 to 42 yards per minute and the cooling system is a new type atomized spray, which needs no messy pans or squeeze rolls to take off surplus water. The chromed roll and engraving rolls are internally cooled.



**NEWS! Thanks to production economies resulting from redesign of certain parts, this machine is now offered at a new lower price.**

This superior machine for all gauges of vinyl has an operating face of 62", and will handle widths up to 60". We will gladly supply full details. LIBERTY MACHINE CO., INC. 275 Fourth Avenue, Paterson 4, New Jersey.

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High chrome cylinders • Inspection units • Printing presses

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# NEW MACHINERY AND EQUIPMENT

**Extruder**—Model T-8 extruder, built by Bandera of Italy and distributed in the United States by Barzantni International Inc., 589 E. Illinois St., Chicago, Ill., has fully variable speed control, barrel ratio of 17 to 1, and a choice of screws. All gears in the unit are in oil bath. There are three heating zones, with additional zones at the adaptor plate and die head. The equipment is also available with the Bandera controlled-speed selector, a step-speed control which prevents speed change in the machine by unauthorized personnel.

Also offered by the company is redesigned Model T-120, a 4 4/5-in. extruder which now has an oil bath gear control system and increased barrel length.

**Printing Machine**—Semi-automatic color-banding machine, capable of simultaneously printing up to six color coding bands on cylindrical resistors, condensers, and similar objects has been developed by Markem Machine Co., Keene 42, N. H.

The unit, designated Model 69A, bands components of the following dimensions: 3/16- to 1-in. diameter, 3/8 to 2¾ in. long (body only) and 1¾ to 8 in. long over-all (wire end to wire end). Both color band width and space between bands are reported readily adjustable. Operating speed is governed by operator's loading speed, normally about 50 pieces per minute. Feed from vertical chute to banding position and ejection after printing are automatic.

The machine may also be used for printing complete label detail in one or two colors on cylindrical objects of the above dimensions.

**Drying Tunnels**—Low-cost quick assembly of far infra-red tunnels for screen process drying is claimed for Air-Flow Drying Tunnel Kits, offered by Edwin L. Wiegand Co., 7503 Thomas Blvd., Pittsburgh 8, Pa. In addition, the kits are said to make possible savings of floor space and reduction of production costs.

Two models are available. One has a hood length of 46 in., distance between belt centers of 84 in., and contains three radiant heaters rated at 2.5 kw. each. The other has a 70-in. hood, 108-in. belt length, and six heaters of the same rating. With both models, belt speeds from 5.6 to 23.4 ft./min. can be obtained, and intensity of heaters can be varied from 4 to 100% of capacity.

Each kit contains the component parts required to construct a tunnel with 36 in. wide belt. They contain, in addition to the heater units, Unistrut framing, variable-speed transmission, drive motor, motor-driven fan, heat control equipment, and all other necessary accessory equipment. An exhaust hood is not included.

**Molding Presses**—Two models have been added by F. J. Stokes Machine Co., Inc., 5500 Tabor Rd., Philadelphia 20, Pa., to its line of semi-automatic fully hydraulic compression and transfer molding presses. Both are 50-ton units.



Stokes' Model 726 semi-automatic, straight-ram compression press has three-speed, controlled closing action

Model 726 compression press is a straight ram machine designed to do deep-draw work at high speeds. A three-speed controlled closing action reduces closing time and eliminates possibility of mold damage. Initial ram approach is at high speed, with a slower intermediate approach; final closing is only as fast as the molding material plasticizes—giving molded parts high density and uniformity (desirable for pieces with projections and small pins, as well as for insert work.) A double-acting ram eliminates the need for external pull-back cylinders and the extra hydraulic equipment required for them.

Model 727 transfer press is said to have an extra-long transfer stroke which permits complete withdrawal of the plunger from the loading area to give ample clearance for loading preforms. The unit is designed to accommodate both top and bottom ejection molds. Transfer pressure can be adjusted over the full range of pumping pressure without affecting adjustments to the clamping ram. This model also incorporates three-speed closing and double-acting ram.

Both machines have Stokes bar-type controllers. This accessory provides automatic control over every phase of the molding cycle by means of readily positioned buttons located on graduated bars. Settings can be adjusted to meet new requirements when molds are changed, and can be changed even while the press is in operation. A single electric timer is said to be sufficient.

Optional equipment for both units includes hot plates for either steam or electric heating, water cooling of molds, and adjustable head with or without longer tie-rods.

**Release Agents**—Reported to be equally effective when used with phenolics, ureas, melamines, polyester resins, and epoxy resins, a liquid mold release for compression molding, laminating, casting, and lay-up molding dries almost instantly upon application and produces a hard, smooth, glossy surface which acts to prevent sticking of material to the molds. The parting agent, designated R-2, is manufactured by Vin-Rock, Inc., 8211 Almira Ave., Cleveland 2, Ohio, and




MODEL
H-250

NEW!

# VAN DORN
## 2½ Oz. Automatic Press

Check these outstanding features of this ultra-modern Van Dorn injection press:—

**GREATER CAPACITY**— Up to 2½ oz.; smaller pieces at faster cycles.

**HI-SPEED PERFORMANCE**— Plasticizes material at 22 lbs. plus per hour.

**FASTER PRODUCTION**—Will attain up to 720 cycles per hour (dry run).

**HIGHEST EFFICIENCY**—Due to water cooling of injection plunger, transfer hopper and oil cooler.

**ACCESSIBILITY**— Due to simple platen clamp device for purging to change material or color.

**MORE SAFETY**— Mold hydraulic mechanism makes press non-operative unless molded part is completely ejected.

**SIMPLER OPERATION**—Due to automatic, adjustable material metering device.

**MULTIPLE OPERATIONS**—Minimum operator attention by use of larger hopper and light that indicates when press needs attention.

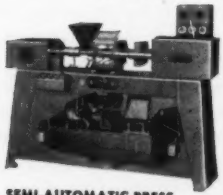
**SELECTIVE CONTROL**—Merely throw toggle switch to operate press semi-automatically.

**DEPENDABILITY**— Because of all-steel construction and Van Dorn's established reputation in the plastics machinery field.

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***and this Van Dorn model is the lowest priced press in its class!***

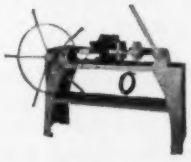
**WRITE FOR COMPLETE DATA ON MODEL H-250 AND OTHER EQUIPMENT SHOWN**



**SEMI-AUTOMATIC PRESS**
2-oz. capacity.



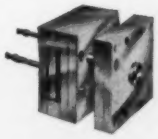
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2-oz. and 1-oz. models



**MANUALLY OPERATED PRESS**
1-oz. For small jobs, training, etc.



**PLASTIC GRINDER**
Grinds up rejects, waste, etc., for re-use.



**MOLD BASES**
Available from stock.

is packaged in 12-oz. Aerosol-type cans suitable for spray use.

The company also produces a liquid mold release agent for injection molding. Designated V-1, the release is primarily intended for use with styrene, but can also be used for the release of other thermoplastics, including acrylics, vinyls, and nylon. V-1 is available in pressurized 12-oz. spray cans, 1-qt., and 1-, 5-, and 55-gal. bulk containers. It can be either sprayed or brushed on.

Both release agents are crystal clear and are claimed not to discolor even the lightest plastics. They are also said not to affect the paintability or cementability of the molded pieces.

**Painting Accessory**—Spray mask washing machine Model W-54-M, developed by Sepanski & Assoc., 900 Clancy Ave., N.E., Grand Rapids 5, Mich., is designed for portable use or for installation in cramped quarters in, or adjacent to, spray finishing stations.

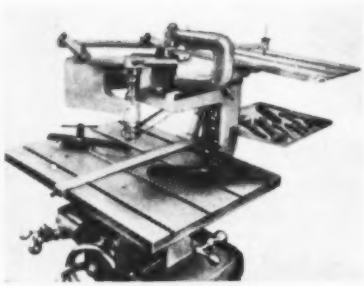
The machine is reported to have an automatic pneumatic cleaning cycle, employing high-pressure solvent spray through four nozzles—solvent being automatically returned to a closed reservoir after completion of each cycle.

A positioning rack holds spray masks to be washed in place during the jet spray cleaning. Masks can be positioned in relation to the spray in 1-in. increments, vertically and horizontally. Nozzles are adjustable for most efficient spray pattern. Cycles of 60 complete cleanings per hr. (120 when two masks can be cleaned at one time) are claimed for the unit.

The tank-like equipment stands 32 in. high and is 14 in. in diameter. Sole operating requirements is a ¼-in., 50 p.s.i. air line.

**Work Table**—Designed for use with its Model 2D-4, a large work table (18 by 24 by 1 in. thick), produced by H. P. Preis Engraving Machine Co., 44 Industrial Branch, Hillside, N. J., is reported to be also attachable to most other types of engraving machines.

Designated as the Preis Panto Auxiliary Work Table Attachment, the unit has T-slots running its entire length, allowing use of standard clamps for holding work. It is also



**Preis Engraving's work table attachment has T-slots running entire length, allowing use of standard clamps**

provided with a clamping T-square for lining up work, an extension for a work table crank handle, and four bolts for mounting to the standard work table.

When used with the Model 2D-4, the maximum distance from the work table to the spindle cutter chuck is 2¾ in., with the table mounted over the machine column. When mounted to the extreme left of the work table, it can be lowered so that panels or boxes up to 5 in. high can be engraved.

**Sealer**—Equipped with an adjustable floor stand, high-speed Jaw Bag sealer, produced by Amsco Packaging Machinery, Inc., 31-31 48th Ave., Long Island City 1, N. Y., can be set along-side existing conveyor systems without special installation. Operated by a hand crank, the floor stand can be raised or lowered to suit bags of different heights.

The Jaw Bag sealer automatically header-labels and seals thermoplastic bags. Bags of non-heat-sealable materials are automatically closed with thermoplastic header-labels.

Amsco has also developed a code-dating attachment, for use on the Jaw Bag sealer. Use of this attachment makes sealing, header-labeling, and code imprinting a single, simultaneous operation. Impression-type code dates of up to five digits are possible with it, with each digit up to ⅛ in. wide and 3/15 in. high.

Also available is an attachment for punching holes through the header-label and bag.

**Embossing Attachment**—Attaching directly to embossing equipment, the Valley Printing Machine, manufactured by Liberty Machine Co., 275 Fourth Ave., Paterson, N. J., is reported to improve the appearance and emphasize the contours of embossed film and sheeting by laying color into the depressed portions of a pattern without depositing it on the raised surfaces. Available in sizes to fit all embossing machines, the unit is said to function without attention from the operator.

**Tappers**—Changes incorporated in a line of redesigned tapping and threading attachments are said to have resulted in higher-speed production and smoother controlled clutch power. The attachments are produced by Ettco Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, N. Y.

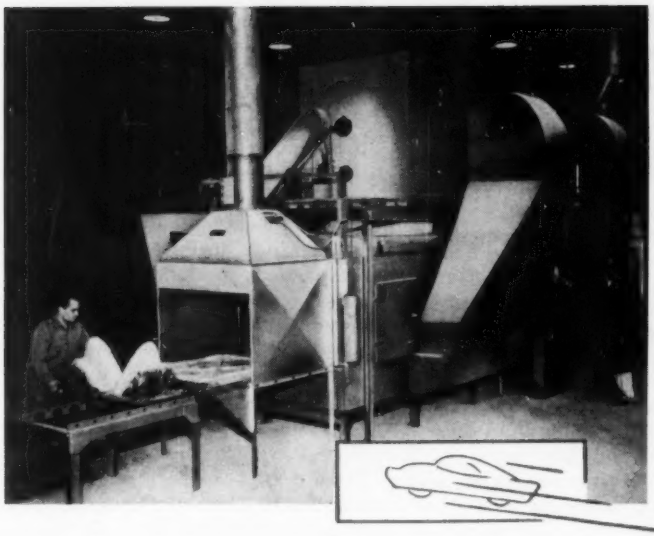
Among the changes that have been made are the following: 1) the aluminum clutch has been replaced by a steel clutch which incorporates a built-in fan that whips the oil held in the attachment's case into a mist, drawing it across the clutch faces and increasing their service life; 2) leather friction material has been replaced with a rubber-bonded synthetic material said to be impervious to heat, oil, or water.

**Gage Cutout**—Claimed to give low-cost protection against excessive line pressures that might damage expensive gages, meters, and instruments, Greer Hydraulics, Inc., 454 18th St., Brooklyn 15, N. Y., offers a gage cutout in two models—a low-pressure cutout which ranges from 10 to 300 p.s.i. and a high-pressure cutout which ranges from 100 to 3000 p.s.i.

**Extruder**—Model TE-1 Teflon wire insulating extruder, produced by Jennings Engineering, Inc., 3457 Chestnut St., Philadelphia 4, Pa., is an automatic unit weighing 4000 lb., and occupying a space 9 ft. long, 3 ft. wide, and 14 ft. high.

In operation, it runs bare wire from a spool through an extruder unit assembly where paste Teflon is applied to the wire, then through a vaporizing oven where the extrusion aid is removed from the Teflon, and finally through sintering ovens where the resin is baked to the wire. The coated wire is then rewound on a take-up reel.

Wire breakage during the take-up process is reported to be eliminated by a tensioning assembly. Coating density, wire speed, and oven temperatures are regulated at a control panel.



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## *REINFORCED PLASTIC CAR BODIES*

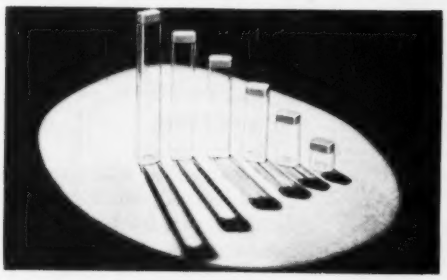
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Auxiliary charging mechanism and unloading tables accommodate various types of standardized pallets on which the preform screens are attached—(automatic handling of preform screens is optional). Units are designed in accordance with the Class "A" oven code and warrant the approval of your factory insurance carrier. With OFI equipment you can be assured of more rapid drying, curing and uniform processing because of the extensive experience of our staff of specialized oven engineers. *Contact us for prompt action and recommendations on your requirements.*

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# BOOKS AND BOOKLETS

**Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.**

**"A Line-Formula Chemical Notation," by William J. Wiswesser.**

Published in 1954 by Thomas Y. Crowell Co., 432 Fourth Ave., New York 16, N. Y. 150 pages. Price: $2.00.

A new system of chemical notation, designed to provide a straightforward way of indexing chemical compounds and to reduce the growing confusion in chemical nomenclature is here suggested. The system is so designed that it is possible, by using a standard typewriter, to fully describe the chemical nature and structure of simple as well as complex compounds. Based on the principle of the resolution of possible notations for a given structure on the basis of the position of the symbols in the alphabet, the system makes use of conventional symbols and adds several of its own—all, however, found on a regulation typewriter keyboard. The new technique is discussed with reference to aliphatic and cyclic compounds. Sets of review exercises are included to aid the reader in learning the notations.

**"Indian Plastics Directory"**

Published in 1954 by Plastics & Machinery Distributors, 4 Upper Chitpur Rd., Post Bag No. 6703, Calcutta 7, India. 216 pages. Price: $3.00.

This second edition of the directory of the Indian plastics industry contains names and addresses of most firms working in plastics in that country. The following classifications are covered: Names and addresses of plastics manufacturers, dealers in plastics goods, and suppliers of raw materials and machinery (alphabetically); names and addresses of manufacturers of raw material, machinery, molders, extruders, and fabricators (alphabetically); finished products (list of manufacturers by products); manufacturers' representatives; importers; manufacturers and suppliers of chemicals, dyes, and pigments; dealers in finished products (by cities); technical persons in India; list of periodicals; trade associations, federations, and research institutions; consular offices; names and addresses of foreign manufacturers of raw materials (classified by material) and of machinery. A section of technical notes contains basic information on weights and measures conversions, and lists some basic properties of thermosetting and thermoplastic materials.

**Styrene**—This 23-page pamphlet, Bulletin C-4-198, discusses and illustrates the use of styrene monomer in synthetic rubbers, polystyrene, high-styrene latices, polyester resins, styrenated drying oils and alkyds, ion exchange resins, styrene-acrylonitrile copolymers, styrene-maleic resins, and various chemical derivatives. Supplemental information of a more detailed technical nature (chemical reactions, methods of handling, and analysis) are contained in Technical Bulletin C-4-119. *Koppers Co., Inc., Chemical Div., Pittsburgh 19, Pa.*

**Facilities and products**—For those who like their manufacturers' literature spiced with homey philosophy, wit, and anecdotal tidbits, a little 40-page booklet, entitled "Here's Rogers Again," will make pleasant summer reading. Published by a firm specializing in fibrous glass-reinforced plastics and impact phenolics, the brochure touches on such topics as labor relations, expense accounts, cost of a haircut in London, benefit of movie magazines, headaches of legal jargon, white collar unions, what makes good management, and others, with an occasional plug for the company's products thrown in. *Rogers Corp., Oakland St., Manchester, Conn.*

**Plasticizers**—A concise discussion of the subject of plasticizers is handsomely and effectively presented in this 63-page brochure. Divided into five sections, the text first delves into the subject of plasticizers in general, covering the chemical and physical theory underlying their action as well as the effects of their application. It then proceeds to examine the factors which determine the selection of the proper plasticizer for any particular resin and describes a line of plasticizers developed for these resins. The remainder of the brochure is taken up by graphs and tables which furnish information on comparative performance, permanence, and cost of various plasticizers, properties imparted by plasticizers to various compatible resins, physical and chemical properties and specifications for a complete line of plasticizers, and viscosity curves for several plasticizers. Available literature, primarily technical, is also listed. *Monsanto Chemical Co., Organic Chemicals Div., St. Louis 1, Mo.*

**Specifications**—An up-to-date chart—a revision of one first issued in 1951—shows the standard grades of the company's laminated plastics which meet applicable government specifications. The chart covers laminated tubes, rods, and sheets for Military, Navy, JAN, Federal, Bur. Aero., AAF, and A.S.T.M. specifications. *Synthane Corp., Oaks, Pa.*

**Roll design**—The subject of bending moment of shafts is covered from an engineering viewpoint in a report entitled "Roll Shaft Breakage." Two different shaft designs are compared with respect to points of stress concentration and breakage at these points. *Rodney Hunt Machine Co., Orange, Mass.*

**Standards**—The 1953 Supplements to the triennially published Book of A.S.T.M. Standards give 325 specifications, tests, and definitions which were either issued for the first time in 1953 or revised since their appearance in the 1952 book. The seven parts into which the supplements are divided include: Part I, Ferrous Metals; Part II, Non-Ferrous Metals; Part III, Cement, Concrete, Ceramics, Thermal Insulation, Road Materials, Waterproofing, Soils; Part IV, Paint, Naval Stores, Wood, Fire Tests, Sandwich Construction, Building Constructions, Wax Polishes; Part V, Fuels, Petroleums, Aromatic Hydrocarbons, Engine Antifreezes; Part VI, Rubber, Plastics, Electrical Insulation; Part VII, Textiles, Soap, Water, Paper, Adhesives,

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For long-lasting color in plastic material for such products as tablecloths, window draperies, bedspreads, shower curtains, upholstery, clothing bags and toys, investigate CYAN BLUE ZGT 55-3300.



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**Filler**—Technical Service Bulletin W-1 points out the advantages of incorporating precipitated calcium carbonates as inert extenders in polyester resins used for molding or casting products. The 4-page bulletin explains that the addition of this chemical reduces resin mixture costs, imparts opacity to plastics, curtails shrinkage and crazing, assures smoother finishes, increases resin viscosity, and improves coloration. It is also claimed that the over-all cost of reinforced plastics parts can be reduced by extending the resin as much as 50% without detracting from final cured properties. Property and test result information is included. *Witco Chemical Co., 260 Madison Ave., New York 16, N. Y.*

**Vinyl film**—Aimed at the retailer, this handbook suggests the steps that can be taken to increase vinyl film sales by promoting those products made of vinyl film that meets specifications of Commercial Standard C.S. 192-53. *The Society of the Plastics Industry, Inc., Vinyl Standards Educational Committee, 67 W. 44th St., New York 36, N. Y.*

**Latices**—Uses and characteristics of 15 styrene-butadiene latices, offered in five different copolymer ratios, are described in an 11-page technical bulletin, C-4-191. The bulletin discusses color, solids content, mechanical stability, shelf life, odor, and dilutability with water. It also lists suggestions and directions for the use of these latices as pigment binders for clay-coated papers and clear paper coatings, in the production of grease-resistant paper and paperboard, in sealer coats on felt base used in floor coverings, in the finishing of textiles, and in rug-backing compounds. *Koppers Co., Inc., Chemical Div., Pittsburgh 19, Pa.*

**Adhesive specifications**—A line of adhesives, coatings, and sealers is listed in this booklet, together with various government specifications that they meet (including Military, Army, Navy, and Federal). A specification cross reference table showing current specification numbers along with those they supersede is also presented. A short description of end uses is given with each specification. *Minnesota Mining & Mfg. Co., Adhesives and Coatings Div., 900 Fauquier Ave., St. Paul 6, Minn.*

**Extruder**—Operations of a machine for extruding Teflon wire insulation are described in this six-page folder. The folder gives, in addition, step-by-step instructions on how to install the 14 ft. high unit, load it with wire and preformed paste, and start and operate it. Specifications are included. *Jennings Engineering Inc., 3457 Chestnut St., Philadelphia 4, Pa.*

**Acrylic emulsion**—Properties and uses of Rhoplex AC-33, an acrylic resin emulsion, in the production of protective coatings, coating for paper, adhesives, and similar applications are presented in this 25-page booklet. Information on manufacturing procedures most useful in producing emulsion paints, and on pigments and other additives used to manufacture protective coatings, is also given. Sources of materials are included. Among applications listed are white coatings, medium-tone tints, deep-tone wall paints, sealers and primers, water based printing inks, and others. Formulations are detailed for most applications. *Rohm & Haas Co., Washington Sq., Philadelphia 5, Pa.*

**Finishing service**—Facilities for high-volume production buffing, polishing, and deburring on a custom basis are described and illustrated in this 6-page folder. *American Buffing and Polishing Co., 525 W. 76th St., Chicago 20, Ill.*

**Selenium rectifiers**—Bulletin 177 catalogs a line of radio and industrial selenium rectifiers, giving voltage curves, circuitry, and product applications. Power rectifiers up to 260 v. input and 30 amp. are tabulated. *Selectron & Germanium Div., Radio Receptor Co., Inc., 251 W. 19th St., New York 11, N. Y.*

**Bushings**—Complete line of bushings for use in making drill templets is described in this catalog. The bushings are either riveted or spotwelded to sheet metal or fastened or imbedded into plastic laminate templets. Detailed instructions on how these templets can be produced in any fabricating shop are given. Advantages claimed for the bushings include savings on material, templet weight reduction, reduced work spoilage, and simplified storage. *The Hi-Shear Rivet Tool Co., 8924 Bellanca Ave., Los Angeles 45, Calif.*

**Process equipment**—Bulletin 2439 gives examples of various types of process equipment made by the company, including autoclaves, reaction vessels, electro-vapor heating systems, digesters, contactors, agitator assemblies, kettles, pilot plants, complete resin plants, and others. Text and illustrations tell how some of this equipment was built and tested. *Process Equipment Dept., Blaw-Knox Co., Pittsburgh 22, Pa.*

**Shell structures**—Use of fibrous glass-reinforced plastics in the manufacture of shell structures is discussed in a 24-page brochure entitled "Glass-Fiber Laminates for Shell Structures." Advantages claimed for the fibrous glass laminates in this application include: 1) lower tooling and die cost; 2) no deformation of the materials; 3) feasibility of thicker shells; 4) proportionately lighter and cheaper circular shells; 5) no need for protective finishing; and 6) dimensional stability. Numerous equations, graphs, and diagrams are included. *Lunn Laminates, Inc., Oakwood Rd. and W. 11th St., Huntington Station, Long Island, N. Y.*

**Finishing equipment**—Details of a regular- and high-velocity pressure blasting process for use in deburring, cleaning, scale removal, and related operations are presented in this 6-page booklet. Also described are the manual and automatic machines used in this process. *The Cro-Plate Co., Inc., 747 Windsor St., Hartford 5, Conn.*

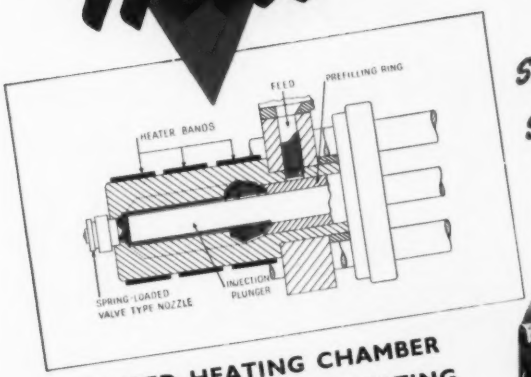
**Printed circuitry**—Tentative property data on an epoxy-type copper-clad laminated plastic for use in the production of printed circuitry are given in this 4-page folder. This laminate is said to improve printed circuit performance. It is also claimed that it can operate at higher temperatures than earlier sheets, that it makes possible sharper etched circuits, that it has extremely high re-

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# INJECTION MOLDING MACHINE

**SPECIFICATION**

| | |
|---|---|
| **Approximate weight of material plasticised per hour** (Dependent upon weight per shot and material used) | 22 lb. |
| *Area of Injection plunger* | 2.074 sq. in. |
| *Pressure per square inch on material at end of plunger* | 9,100 lb. |
| *Total pressure on Injection plunger* | 18,850 lb. |
| *Mold opens (adjustable)* | 6—9 in. |
| *Maximum die space* | 7¼ in. |
| *Minimum die space* | 3¼ in. |
| *Maximum recommended casting area in mold* | 15 sq. in. |
| *Size of die plates* | 16 x 10 in. |

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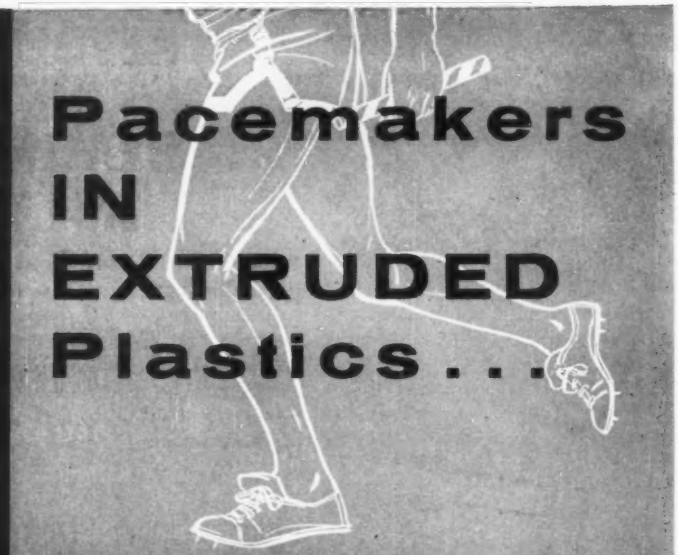
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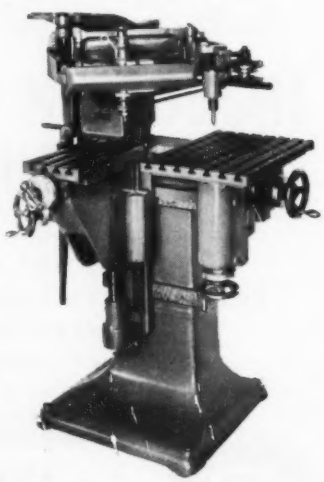
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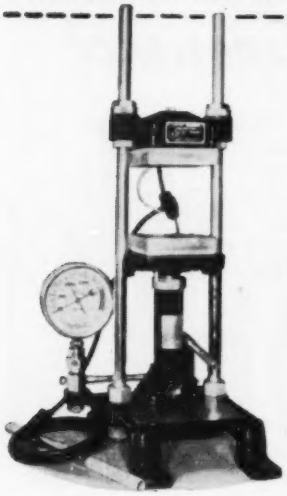
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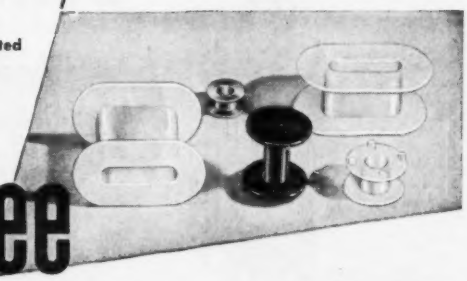
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sistance, and that it is fungus resistant. *The Formica Co., 4614 Spring Grove Ave., Cincinnati 32, Ohio.*

**Fumaric acid**—Bulletin 0-115 describes the use of fumaric acid to improve alkyd resins, polyester resins, tall oil varnishes, steam-set printing inks, and rosin and terpene adducts, and to upgrade drying oils. Processing logs and other data are given. In addition to improving viscosity and color characteristics, fumaric acid, a polyfunctional acid, improves processing by its low toxicity and non-corrosiveness to normal materials of construction. *Monsanto Chemical Co., Organic Chemicals Div., St. Louis 4, Mo.*

**Cylinders**—Price list covering a complete line of stock cylinders is given on a 2-color sheet. The listing includes air cylinders (2- through 8-in. bores), hydraulic cylinders (1½- through 4-in. bores), and both cushioned and non-cushioned types of cylinders. Strokes range from 2 to 13 inches. The sheet also contains line drawings showing how interchangeable mountings can be assembled to obtain up to eight models from one basic unit. *Miller Fluid Power Co., 2040 N. Hawthorne Ave., Melrose Park, Ill.*

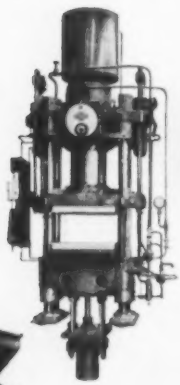
**Heat recovery**—Bulletin WC-114 presents a method of quickly calculating the B.T.U. savings made possible with a continuous blow-off heat recovery system (in annual savings in millions of B.T.U.). The bulletin gives the necessary equations and graphs for rapid calculations of the savings. Graphs are based on 75% boiler efficiency. For other efficiencies, results obtained on the graph are multiplied by proper ratios. *Graver Water Conditioning Co., 216 W. 14th St., New York 11, N. Y.*

**Molds**—Non-shrinking cast metal shell molds, made by a process designated by the manufacturer as "dual-cast," are described in this pamphlet. The process is used to create molds for straight vacuum forming or drape vacuum forming, as well as matched metal molding of polyesters and foamed polystyrene. Molds are built approximately ⅜ in. thick over-all and include a cast clamping frame (which needs no rubber gasket), hinges, and hooks. No additional support is required on the underside. Each mold is guaranteed unbreakable. Water tubing for cooling and steam tubing for heating are also being cast into these units. *Victory Mold & Die Co., 53 W. 36th St., New York 18, N. Y.*

**Hydraulic components**—Condensed catalog 1101 is a comprehensive guide to a line of hydraulic components which includes pumps, motors, power units, cylinders, valves, and hydraulic circuit cylinders. Unabridged catalogs for all of these components are also available and have been previously reviewed in these columns. The present catalog is designed to give a quick survey of general specifications of the line. *The Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.*

**Vacuum metallizing**—Economies and increased efficiency resulting from the use of stranded tungsten filaments in vacuum metallizing are outlined in this reference folder. The physical properties of tungsten strand are given, as well as tables showing the increase in radiation surface of stranded filaments over

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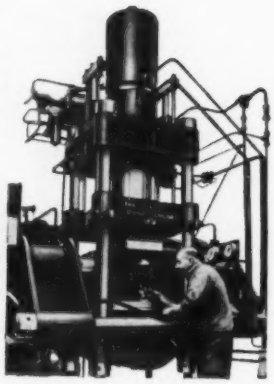
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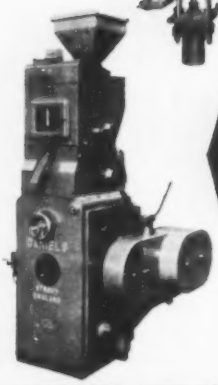
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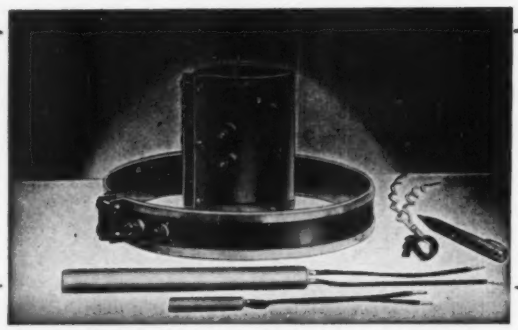
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single wire. A representative list of vacuum metallizing applications is also included. *Bergen Wire Rope Co., Tungsten Div., Lodi, N. J.*

**Motors**—Typical examples of the use of electric motors in various industries are photographically depicted in this 8-page bulletin. The industries covered include plastics, metal, food, and others. Applications of electric motors in the plastics industry include agitators, injection machines, mixing tanks, assembly lines, and others. *Sterling Electric Motors, Inc., 5401 Telegraph Rd., Los Angeles 22, Calif.*

**Furan coating**—Bulletin 400 describes an unplasticized, furan-based, flexible coating, available in a limited range of colors. This coating is prepolymerized and completes its polymerization after application without addition of catalyst. Application of the coating is similar to that of vinyl, but its resistance to acids, alkalies, and solvents is claimed to be greater. The bulletin covers the following: application to most types of surfaces, including rusty steel; technical explanations of film polymerization; general corrosion resistance; and distinctive characteristics and uses. *Carboline Co., Div., Mullins Non-Ferrous Castings Corp., 331 Thornton Ave., St. Louis 19, Mo.*

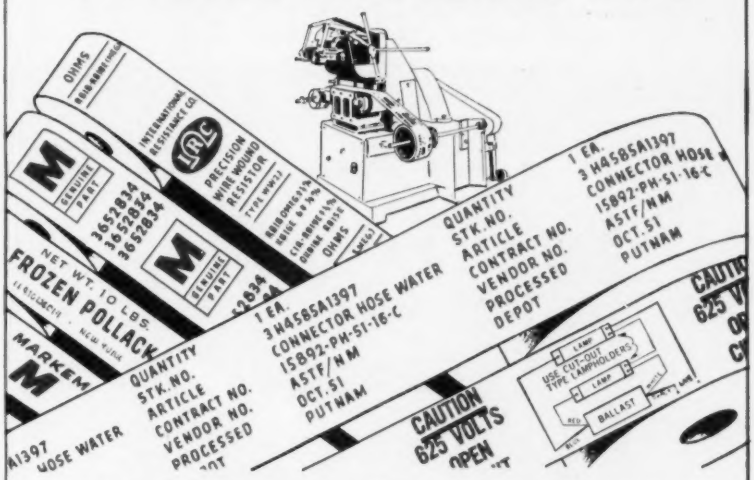
**Automation**—Addressed to the top executive echelon of manufacturing companies, this booklet points out the significance of present-day automation and discusses the various factors that determine whether any given factory can be adapted to complete or even to partial automation *T.A.B. Engineers, Inc., 767 N. Milwaukee Ave., Chicago 22, Ill.*

**Fibrous glass**—Properties, uses, and methods of application of eight types of facings and coatings to fibrous glass insulation are discussed in this guide. Standard facings which are covered include aluminum foil, paper, vinyl, saran, neoprene, glass cloth, and others. *Libby-Owens-Ford Glass Co., Nicholas Bldg., Toledo 3, Ohio.*

**Extender**—Technical and application information on Vinsol, a dark-colored, high-melting thermoplastic resin used as a modifier and exten-


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der for phenol-formaldehyde resins, is presented in this revised 32-page booklet. Sections on Vinsol-aldehyde condensates, solvent-blended Vinsol-phenolic resins, water-blended Vinsol-phenolic resins, and Vinsol-phenol-formaldehyde copolymers are included. *Hercules Powder Co., Inc., Naval Stores Dept., 954 Market St., Wilmington 99, Del.*

**Containers**—This catalog and price list presents over 80 stock containers for standard and promotional packaging. The containers are made of styrene and polyethylene, and are available in a variety of opaque and translucent colors, as well as in water white. Information on imprinting is also included. *Plastic Container Corp., West Warren, Mass.*

**Mold release**—Two bulletins give application information on a series of mold release agents for use in a variety of plastics molding operations. Bulletin V-1-53 deals with injection molding and certain rubber molding and die casting operations. Bulletin R-2-53 deals with a mold release agent for compression molding, laminating, casting, and low-pressure molding. Technical information on uses for each type of release agent is provided. *Vin-Rock, Inc., 8211 Almira Ave., Cleveland 2, Ohio.*

**Color chart**—Sample strips of acetate, butyrate, and polystyrene film in a range of colors are contained in this revised color chart. Colors shown include 20 metallic colors, 10 chalk colors, 15 transparent colors, and two iridescents. Also included are four embossed patterns and samples of printed acetate and metallic printing. *Coatings Products, 101 W. Forest Ave., Englewood, N. J.*

## Melamine Dinnerware Correction

We have just been informed by Glenn S. Woolley & Co., Ltd., Toronto, Canada, that they are manufacturers of melamine tableware and have been in production since 1948. Unfortunately, this company was not listed in the tabulation of manufacturers of melamine dinnerware which appeared on page 352 of the June, 1954 issue of MODERN PLASTICS. The Woolley brand names are: *Royal Canadian, Forest Garden, American Charm, Tropicale Woodland, Tropicale Rose, Everlast.*

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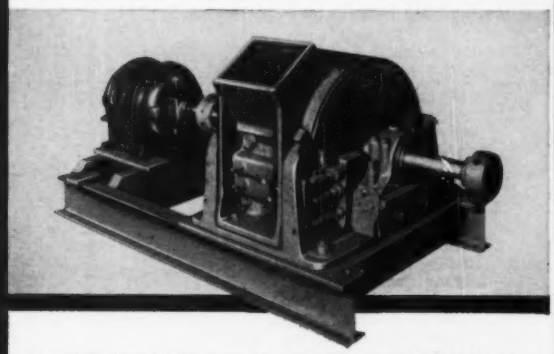
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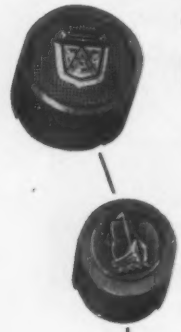
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# Production of

FOR the purpose of this report, production is the sum of the quantities of materials produced for consumption in the producing plant for transfer to other plants

**PLASTICS AND SYNTHETIC RESIN PRODUCTION**
**From Statistics Compiled**

| *Materials* | *Total p'd'n. first 4 mos. 1954* | *Total sales first 4 mos. 1954* |
|---|---|---|
| CELLULOSE PLASTICS:[a] | | |
| Cellulose acetate and mixed ester: | | |
| Sheets, under 0.003 gage | 5,828,528 | 5,579,519 |
| Sheets, 0.003 gage and over | 3,871,583 | 3,931,833 |
| All other sheets, rods, tubes | 1,879,856 | 1,670,336 |
| Molding, extrusion materials | 2,370,319 | 23,129,205 |
| Nitrocellulose sheets, rods, tubes | 2,376,202 | 1,916,805 |
| Other cellulose plastics | 1,850,730 | 1,534,843 |
| PHENOLIC AND OTHER TAR-ACID RESINS: | | |
| Molding materials[a] | 65,316,569 | 58,079,017 |
| Bonding and adhesive resins for: | | |
| Laminating (except plywood) | 21,463,103 | 14,250,210 |
| Coated and bonded abrasives | 3,063,310 | 3,411,533 |
| Friction materials (brake linings, clutch facings, etc.) | 4,751,781 | 4,776,169 |
| Thermal insulation (fiber glass, rock wool) | 9,448,480 | 10,154,463 |
| Plywood | 10,346,777 | 9,915,608 |
| All other bonding and adhesive uses | 5,133,612 | 5,181,389 |
| Protective-coating resins | 7,565,385 | 7,393,658 |
| Resins for all other uses | 8,693,334 | 7,224,080 |
| UREA AND MELAMINE RESINS: | | |
| Textile-treating and textile-coating resins | 12,094,510 | 9,563,951 |
| Paper-treating and paper-coating resins | 6,822,490 | 5,850,326 |
| Bonding and adhesive resins for: | | |
| Plywood | 24,905,850 | 22,097,882 |
| All other bonding and adhesive uses, including laminating | 8,212,467 | 7,565,579 |
| Protective-coating resins | 8,796,567 | 6,347,729 |
| Resins for all other uses, including molding | 22,608,652 | 20,963,254 |
| STYRENE RESINS: | | |
| Molding materials[a] | 106,814,459 | 108,005,348 |
| Protective-coating resins | 27,005,980 | 26,645,348 |
| Resins for all other uses | 31,643,424 | 29,931,980 |
| VINYL RESINS, total[b] | 170,161,261 | 167,813,002 |
| Polyvinyl chloride and copolymer resins (50 percent or more polyvinyl chloride) for: | | |
| Film (resin content) | | 23,845,200 |
| Sheeting (resin content) | | 24,399,860 |
| Molding and extrusion (resin content) | | 45,339,765 |
| Textile and paper treating and coating (resin content)[c] | | 18,289,093 |
| Flooring (resin content) | | 5,407,019 |
| Protective coatings (resin content) | | 7,335,745 |
| All other uses (resin content) | | 8,840,360 |
| All other vinyl resins for: | | |
| Adhesives (resin content) | | 8,892,247 |
| All other uses (resin content) | | 25,151,061 |
| COUMARONE-INDENE AND PETROLEUM POLYMER RESINS | 56,272,889 | 65,723,027 |
| MISCELLANEOUS: | | |
| Molding materials[a, d] | 64,046,815 | 52,959,416 |
| Protective-coating resins[e] | 3,222,366 | 1,327,746 |
| Resins for all other uses[f] | 37,450,887 | 39,298,929 |

* Dry basis is designated unless otherwise specified.
** Partially estimated. † Revised.
[a] Includes fillers, plasticizers, and extenders. [b] Production statistics by uses are not representative, as end use may not be known at the time of manufacture. Therefore, only statistics on total production are given. [c] Includes

# Plastics Materials

of the same company, and for sale. Sales include only the quantities involved in bona fide sales in which title passes to the purchaser.

**IN POUNDS* FOR MARCH AND APRIL 1954**
**by U. S. Tariff Commission**

| *March*** | | *April*** | |
|---|---|---|---|
| *Production* | *Sales* | *Production* | *Sales* |
| 1,602,752 | 1,745,406 | 1,436,261 | 1,355,999 |
| 1,138,677 | 1,031,322 | 823,313 | 908,746 |
| 559,446 | 470,620 | 456,101 | 376,976 |
| 6,257,292 | 6,069,271 | 6,477,706 | 6,312,844 |
| 661,945 | 501,169 | 553,800 | 431,916 |
| 523,887 | 299,064 | 427,994 | 334,889 |
| †18,670,811 | 15,062,409 | 15,326,978 | 14,129,538 |
| 5,832,032 | †4,102,511 | 5,502,029 | 3,704,856 |
| 815,570 | 840,786 | 729,291 | 875,323 |
| 958,157 | 1,213,681 | 1,436,234 | 1,284,957 |
| 2,564,377 | 2,990,375 | 2,527,045 | 2,486,220 |
| 2,587,969 | 2,406,431 | 2,560,759 | 2,367,357 |
| 1,228,260 | 1,229,286 | 1,081,143 | 1,144,954 |
| 2,077,572 | 1,880,561 | 1,949,877 | 1,947,284 |
| 2,763,558 | 2,368,857 | 2,403,563 | 1,964,153 |
| 3,168,450 | †2,959,741 | 2,986,009 | 2,831,836 |
| 1,835,299 | 1,284,166 | 1,592,857 | 1,523,006 |
| 6,410,207 | 5,809,207 | 6,901,878 | 6,881,334 |
| 2,456,270 | †2,096,794 | 1,554,314 | 1,707,311 |
| 2,294,477 | 1,482,431 | 2,332,053 | 1,875,798 |
| 6,087,387 | 6,102,015 | 4,856,971 | 5,063,150 |
| 28,351,133 | 30,086,793 | 28,818,716 | 29,291,082 |
| 6,854,982 | 6,752,211 | 7,290,918 | 7,288,166 |
| 8,901,314 | 7,643,845 | 8,070,456 | 8,390,533 |
| 46,302,532 | 45,819,393 | 43,413,035 | 44,760,154 |
| | 7,348,279 | | 6,457,255 |
| | 6,789,829 | | 6,454,798 |
| | 12,254,523 | | 12,568,175 |
| | 4,826,153 | | 4,479,101 |
| | 1,431,752 | | 1,894,201 |
| | 2,028,824 | | 1,863,649 |
| | 2,391,647 | | 2,311,021 |
| | 2,621,876 | | 2,407,193 |
| | 6,126,510 | | 6,324,761 |
| †17,938,792 | †18,077,839 | 16,528,868 | 16,837,785 |
| 17,057,642 | 13,807,588 | 15,584,094 | 12,449,425 |
| 350,612 | 346,771 | 1,843,894 | 328,359 |
| 9,322,977 | 10,250,624 | 9,863,454 | 10,205,883 |

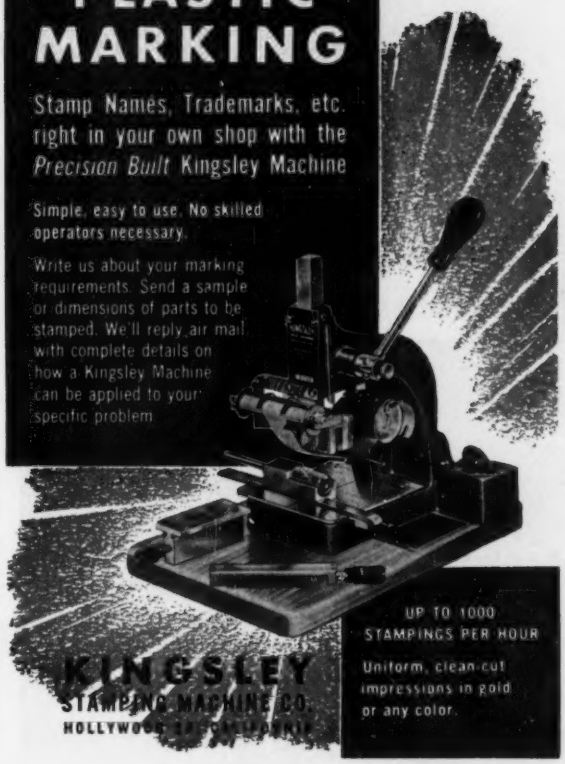
data for spreader and calendering-type resins. [d] Includes data for acrylic, polyethylene, nylon, and other molding materials. [e] Includes data for epichlorohydrin, acrylic, polyester, silicone, and other protective-coating resins. [f] Includes data for acrylic, rosin modifications, nylon, silicone, and other plastics and resins for miscellaneous uses.


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- O-16 (Iso-Octyl Palmitate)
- TG-8 (Triethylene Glycol Dicaprylate)
- TG-9 (Triethylene Glycol Dipelargonate)
- DOP (Di-2 Ethylhexyl Phthalate)
- DOA (Di-2 Ethylhexyl Adipate)
- DIOA (Di-Iso-Octyl Adipate)
- DOS (Di-2 Ethylhexyl Sebacate)
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* *Chemical Products Corp. are manufacturers of Chem-o-sol only. Information on the source of coated yarn furnished on request.*

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## Window Gasket

ONE of the largest silicone rubber window gaskets ever made has been molded for use by the Climatic laboratory of the U. S. Army Quartermaster and Development Center at Natick, Mass.

Inside dimension of the gasket is 24 by 24 in., the channel is 4¾ in. deep, and the cross-sectional thickness is approximately ¾ inch.

Size, however, was only one of the considerations for this job. Army specifications also required that the finished gasket stretch over and provide a tight seal around a Thermopane window, consisting of Herculite glass in a metal frame, and that it be made of a material that would allow it to remain operative and retain its full sealing efficiency over a wide range of temperature variations, extending from sub-zero arctic cold to torrid tropical heat.

The material which was selected for the job was Silastic #152. It met the temperature differential specifications (—70 to 160° F.) and had the elongation, tensile strength, and resilience characteristics necessary for the continuous maintenance of a tight seal around the glass.

The gasket was molded in a single-cavity, one-piece mold. Seven days were required to accomplish full cure, using an oven especially built for this project and employing step-grade temperature increase techniques.

CREDITS: Gaskets molded by Bacon Industries, Inc., Watertown, Mass., using Silastic #152 silicone rubber molding material manufactured by Dow Corning Corp., Midland, Mich.



Silicone rubber gasket makes effective seal over wide temperature range


*your product... clad in*

STERLING SILVER

*to capture sales!*








...The patented G.M.C. process of precious metal decoration on plastics

True proof of the irresistible sales appeal of G.M.C.-processed plastic products is only partly captured in the picture. Before-and-after case histories of the sales volume of a long series of plastics products give the real measure of the dollar-and-cents value of this exclusive decorating technique.

**Consider these important factors:**

- *the cost per unit for beautiful G.M.C. decoration is surprisingly modest*
- *the retail tag of G.M.C.-decorated products can often be doubled or trebled*
- *any plastic material can be decorated in precious metal*
- *there's literally no limit to the delicacy of pattern that can be applied by the G.M.C. process*

Investigate now! Ask us to decorate a sample of your product with a gleaming design in precious metal. Judge for yourself—better yet, ask your customers to tell you—the increased sales potential that results. Send your sample to us today—there's no obligation, of course.

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# NOW! BOTH FIBRE *FROM ONE SOURCE*

## RHEEM Announces a Complete Line of Fibre Drums to Provide an All-Inclusive Shipping Container Service

To supplement its line of steel shipping and custom equipment containers, Rheem has added a complete line of Fibre and Fibre-Metal drums. These strong, light weight, inexpensive drums come in four types and in a wide variety of sizes.






### EVERY SIZE FOR EVERY NEED

Choose the size that best fits your needs. Fibre drums from 1 to 32-gallons in capacity; Fibre-Metal drums from 5 to 60-gallons. There is virtually a size for every possible requirement.

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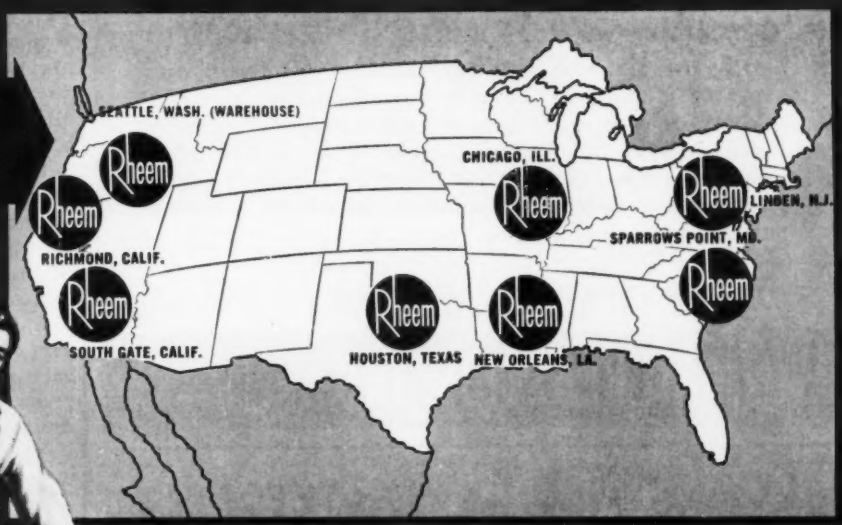
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# AND STEEL DRUMS - RHEEM

RHEEM STEEL CONTAINERS ARE MANUFACTURED IN SEVEN STRATEGICALLY LOCATED PLANTS







30 gal. Rheem Fibre-Metal Drum  55 gal. Rheemcote Steel Drum

## "FAMILY" IDENTIFICATION

Rheem can furnish on Fibre drums the same type of decorative service it provides users of Rheemcote lithographed steel drums. Any design or trade mark can be reproduced on an all-over label for Fibre drums in any number of colors to provide "family" identification for your products.

Rheem Fibre Drums are now being manufactured at four of these plants and additional production lines are scheduled for installation soon.

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*PLASTIC TOOL DEVELOPMENT FOR AMERICAN INDUSTRY*

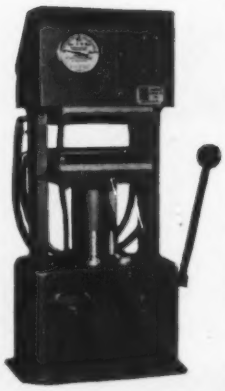
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# THE P·H·I PRESS*

## A New "JUMBO" Model



20-ton model

Meeting industry-wide demands, PHI now presents the 60-ton H Type "Jumbo" Model with 18" x 18" platens. Ram: 6¾". Stroke: 4½". Hydraulic Pump: *Manual, Air or Electric.* Temperature Control: *To 600°, including cooling.* Modifications to suit customer requirements. Write for detailed circular.

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**PASADENA HYDRAULICS, INC.**
279 N. Hill Ave., Pasadena 4, California

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**Operation of thermostat housed in vinyl tubing is not affected by moisture**

## Thermostat Sleeve

PROBLEMS arising in the control and detection of temperature as the result of the presence of moisture have now been overcome through the use of extruded vinyl sleeving as thermostat housings.

By enclosing its standard Thermoswitch units within flexible vinyl tubing and dielectrically sealing the assembly, Fenwal, Inc., Ashland, Mass., has developed a thermostat system that functions properly under conditions of moisture saturation and even when completely submerged. Units come in sizes ranging from 5 to 7⅜ in. long, with diameters of approximately 1 inch.

Vinyl was selected for the tubing because it made possible a good bond with the vinyl insulation on wires leading to the thermostat, keeping it firmly anchored, and also because vinyl has high moisture and chemical resistance. It will withstand 10% caustic acid, pickling acid, plating bath acids, hydrofluoric acids, nitric acids (up to 150° F.,) chromic acid, and acids and bases in general (except for sulfuric acid of 93% and higher concentrations and glacial acetic acid). The effect of 46% sodium hydroxide is said to be negligible. Temperature range of the units is from 10 to 167° F.

Thanks to the vinyl tubing, Thermoswitch units can now be used for temperature detection and control in a larger variety of applications, including plating baths, refrigeration, greenhouses (in hot beds and highly humid atmospheres), farms (dairy barns, brooder houses, drinking troughs), and in industry (chemical processing areas, paint spraying areas, acid spray areas).

CREDITS: XTE-30 vinyl tubing extruded by Irvington Varnish & Insulator Co., Irvington, N. J. for Fenwal, Inc., Ashland, Mass. Dielectric sealing of vinyl sleeves by Fenwal.

## Wiring Strip

EXTRA electrical outlets for appliances, radios, lamps, or power tools, can now be easily added to the home—without cutting into or drilling holes in the walls—by using a new vinyl-covered wiring duct strip with attached outlets.

Each 6-ft. extruded vinyl strip, enclosing No. 12 copper conductors, contains one cord cap and three duplex outfits located about 15 in. apart. To install, the strip is simply plugged into a regular electrical outlet and tacked to the wall, baseboard, beam, or workbench, providing additional outlets where needed. Since the strips can be installed and removed in a matter of minutes, the system is particularly suitable for setting up temporary outlets to meet emergency needs.

If more than six outlets are needed in a room, service can be extended by plugging a second strip into the first system. The run can be as long as desired, provided it does not overload the system. A 12-ft. strip, containing three lamp sockets, one duplex outlet, and one cord cap, is also available.

The vinyl strip is fire-resistant, durable, and shockproof. It is semi-rigid, but flexible so that it can be bent at any angle to go around corners. The strips come in white only and the duplex outlets and lamp sockets are available in either ivory or brown.

CREDITS: Wiring systems are manufactured by Pierceway Div., Clifton Conduit Co., Inc., Memphis, Tenn., using Geon vinyl supplied by B. F. Goodrich Chemical Co., Cleveland, Ohio.

**Vinyl wiring duct strip with three extra outlets is tacked to baseboard**



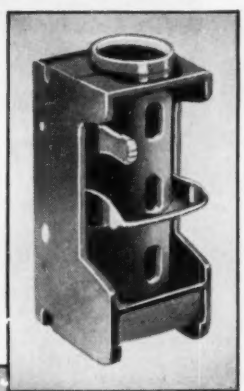




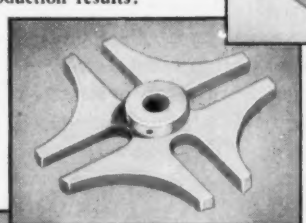
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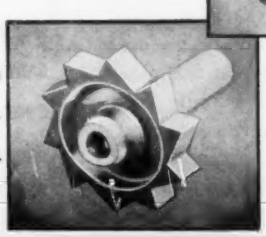


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**NYLON CHANGE CARRIER**— Intricate assembly molded by Danielson Mfg. Co., from Parker molds — engineered for *30 or more years* of flawless performance.

**NYLON STARWHEEL**— One piece molded nylon construction eliminates costly production and assembly line operations — a dramatic demonstration of Parker mold-making skill.

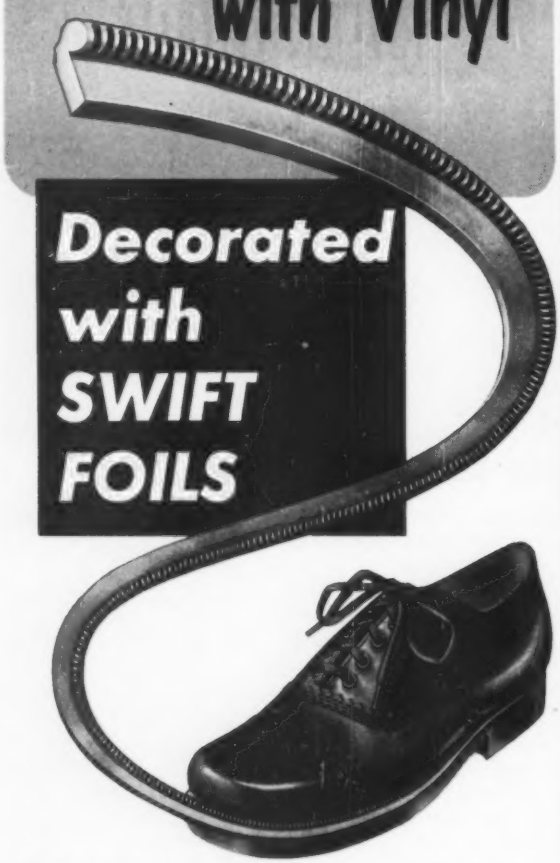


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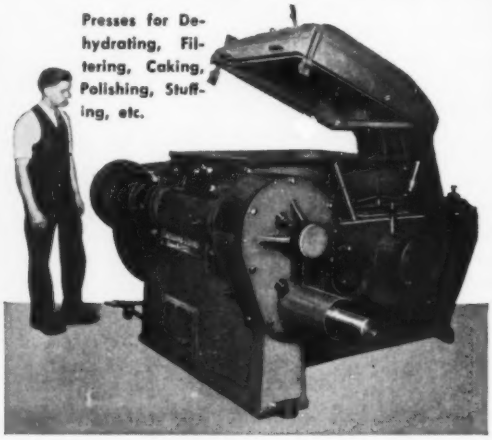
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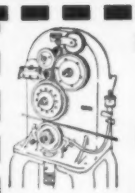
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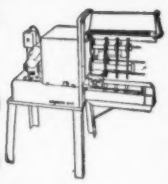


Mixers: Plain or Stainless
Preliminary or Vacuum

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## INKS AND MACHINES





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Reinforced plastic apron protects workers from flying metal particles

## Industrial Armor

ADDED safety for machine shop employees is provided by a protective apron fabricated of fibrous glass reinforced polyester resin laminates.

Although weighing less than 3 lb. —as light as a man's sport jacket— the form-fitting apron is tough enough to stop bullets fired from a .22-caliber long rifle or a .38-caliber special pistol at test distances of 8 and 20 feet. During such tests, conducted prior to adoption of the apron, bullets from the .22 attained a velocity of 1000 ft. per sec. and bullets from the .38 hit the apron with a velocity of 750 ft. per sec., yet neither penetrated it. The 25% polyester resin content of the laminate allows the fibrous glass cloth to separate under impact, cushioning the shock and holding the projectile away from the body.

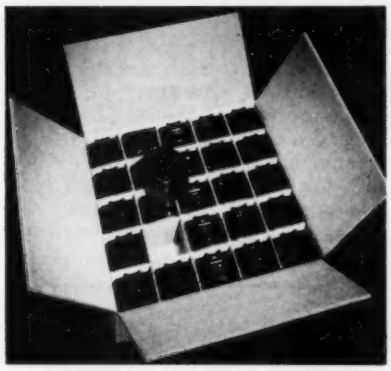
Flying metal particles that may be thrown from high speed milling and cutting machines thus present little danger for the apron-protected machine operator. The aprons are molded to the general shape of the human body for a close comfortable fit and are from 3/32 to 1/8 in. thick. Strings, run through holes cut into the apron, are tied around the body to keep the apron in place while it is being worn.

CREDITS: The aprons were developed by Lockheed Aircraft Corp., Burbank, Calif., and are manufactured for commercial use by B. F. McDonald Co., Los Angeles, Calif., under license from Lockheed.





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invites you to make use of these

**GLASS FIBER CLOTH TREATMENTS and FINISHES**

Glass Fibers uses an exclusive *continuous process* for treating and finishing glass fiber fabrics. This special continuous process insures *exceptional uniformity* and a high degree of control, permitting the removal of part or all of the binder with no risk of damage to the cloth. After treating, *quality control checks* are made, including the making of a test laminate.

**V11** — **HEAT TREATMENT:** The binder content of the cloth is reduced to 0.5%—1.0% and the cloth turns a caramelized brown color. Applications: Used in conjunction with low pressure polyester resins for a few specific applications.

**V11-A** — **HEAT TREATMENT:** The binder content of the cloth is reduced to less than 0.5% and volatile content is less than 0.05%. The treated cloth is light tan in color: Application: V11-A treated cloth is widely used for high pressure lamination with melamine or phenolic resins.

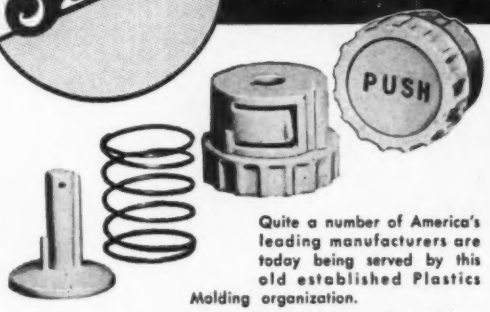
**V12** — **HEAT CLEANING:** Improved treatment to remove all the binder on the cloth. The treated cloth is white in color. Application: For high pressure silicone resin laminations where maximum electrical and physical properties are required. For other special application as well as a prerequisite for process V14 and V21.

**V14** — **WATER REPELLENT CHROME SALT FINISH:** applied to heat cleaned (V12) cloth. The treated cloth has a light green tint color. Application: Widely used for low pressure polyester resin and phenolic applications.

**V21** — **WATER REPELLENT SILICONE TREATMENT:** applied to V12 heat cleaned cloth. The treated cloth is for general reinforcement, especially with polyesters, silicones and epoxy resins. The finish is particularly useful where maximum wet and dry physical characteristics are desired.

. . . For a technical bulletin and complete information, write Glass Fibers Inc., 1810 Madison Ave., Toledo 2, Ohio

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Quite a number of America's leading manufacturers are today being served by this old established Plastics Molding organization.

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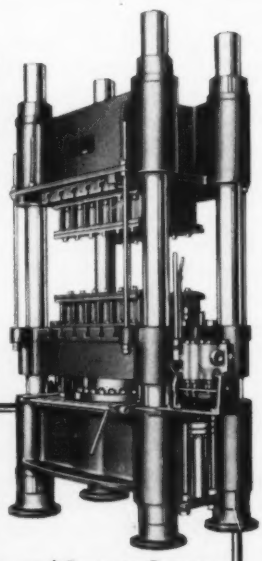
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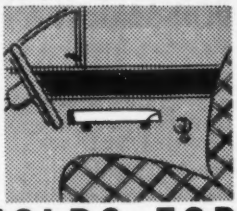
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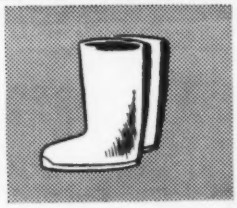

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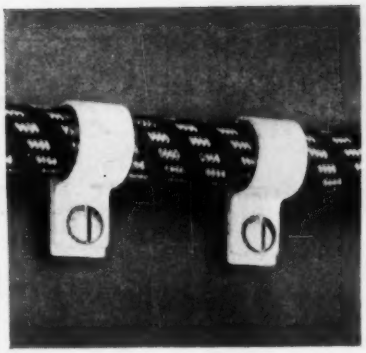
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**Reinforced plastics clamps are lighter, more flexible than metal clamps**

## Cable Clamps

FLEXIBLE, loop-type reinforced plastics cable clamps, developed to meet Army and Navy specifications, are now being made available commercially for use in construction, plant maintenance, power generation, communications, aviation, shipping, and other industries using cable or heavy wire.

According to the manufacturers of the clamps, the switch from metal to fibrous glass-polyester resin laminate for this application has effected economies in cost, weight, and space required, primarily as a result of the fact that the non-conducting material does not require insulation. The plastics clamps are also lighter than aluminum clamps used for comparable holding jobs, will not support combustion, possess high heat resistance, and are fungusproof and non-corrosive.

In contrast to the rigid metal clamps, the flexibility of the reinforced plastics clamps gives them greater fatigue resistance, even when they are subjected to continuous vibration, and substantially increases their service life. At the same time, the flexibility of the clamps permits faster installation.

The new clamps are also claimed to cause less wear on cable insulation than do unprotected metal clamps. They are available in 22 sizes, ranging from a 0.125-in. diameter loop up to a loop measuring 2 in. in diameter.

CREDITS: Reinforced plastics clamps are fabricated by Le Conte Plastics Co., Inc., Farmingdale, N. Y., using Nos. 128 and 164 fibrous glass cloth supplied by Hess, Goldsmith & Co., Inc., New York, N. Y.


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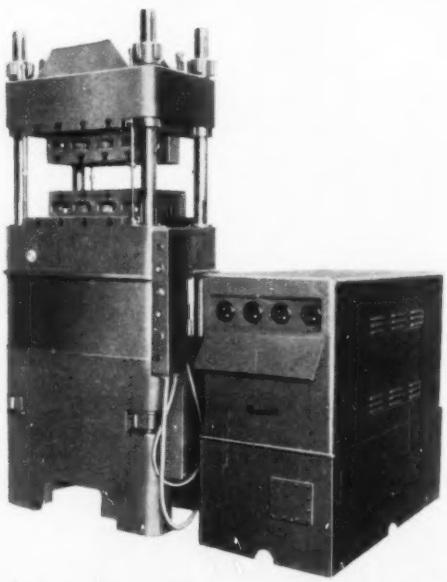
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## Copolymer Guard

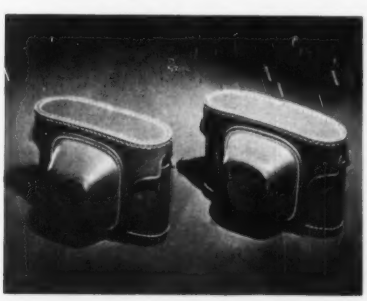
A RUGGED frontpiece or "noseguard" formed from Royalite styrene copolymer sheet has been added to conventional leather camera cases as extra protection for camera lens, mount, and shutter assembly.

The sheet is grain-embossed and colored on one side—the side that faces toward the front—to simulate leather and blend in with the rest of the case. In contrast to the ordinary leather guards previously used, however, the new frontpiece is stronger, will not shatter, and will absorb considerably more punishment with less likelihood of harm to the camera. In addition, the new noseguard will not bend, dent, or otherwise flex under many shocks sufficient to damage the lens mount.

The guard is formed on a 2½-ton air press. The copolymer sheet is first heated for about 2 min. until it reaches a temperature of approximately 200° F. The heated sheet is then formed to shape in matched metal molds, using a spring loaded pressure plate. Dwell time of the force is 0.17 minutes. Die temperature surface readings are as follows: punch—100° F.; cavity—130° F.; and pressure plate—180° F.

The frontpiece, formed in one piece with the company's trade name embossed on it, is machine-stitched to the front cover of the leather case. Despite the fact that the copolymer guard is so much stronger than the leather one, both weigh about the same.

CREDITS: Frontpiece designed for Kodak Pony camera field case by Eastman Kodak Co., Rochester, N. Y. Royalite styrene copolymer sheet supplied by United States Rubber Co. Air press by Logan Engineering Co., Chicago, Ill.



Copolymer noseguard (left) is grained to simulate leather in model at right





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**With L·O·F *Garanized*® roving, manufacturer produces archery bows guaranteed to maintain high flexural strength under hardest usage**

"We are using L·O·F's Garanized roving in our archery bows. We depend on this even-tension material to produce lighter weight bows with greater pulling force, guaranteed for a year of hardest usage," writes L. S. Meyer, president, Parallel Plastics, Inc., Newark, Ohio.

"We can depend on even-tension L·O·F roving to give our Parabows the ultimate in flexural strength. Moreover, the thorough, rapid and complete wetting of Garanized Fiber·Glass roving insures a good bond."

L·O·F Garan treatments, applied to roving, chopped strand, textile yarns and Fiber·Glass cloth, impart great flexural, compressive and tensile strength to reinforced plastics. They also increase translucency.

Laminates, reinforced with Garanized Fiber·Glass roving, cloth or chopped strand, absorb less water, have unusually high wet strength retention. End products are weather resistant and suitable for a wide range of outdoor applications.

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L·O·F Garanized Fiber·Glass roving: Tensile strength of 250,000 lbs. per sq. in. has been recorded on individual glass fibers from which this roving is made.

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# Corrections to Pipe and Fittings Chart

**(Supplement to March 1954 Issue)**

THE editors' attention has been called to omissions in MODERN PLASTICS magazine's Pipe and Fittings Chart, which appeared in our March 1954 issue. Material makers concerned have been consulted and, in the majority opinion, the following changes should be noted in the properties section on the right hand side of the Chart:

**Polyethylene**—Chart rating on resistance to organic solvents should be changed from U to F.

**Styrene alloy**—Water absorption should be changed to 0.1. Resistance to animal and vegetable oils should be changed from E to F, to gasoline and fuel oils, from F to U, and to strong acids, from E to F.

**Rigid vinyl**—Resistance to strong acids should be changed from F to E.

**Modified vinyl**—Resistance to strong acids should be changed from U to F.

In addition, the following companies should be listed as makers of thermoplastics pipe and fittings:

**Chesflex Corp.**, 284 Nepperhan Ave., Yonkers 2, N. Y.: A, B, S.

**Extrusion, Inc.**, Larkin St., Springdale, Conn.: A, B.

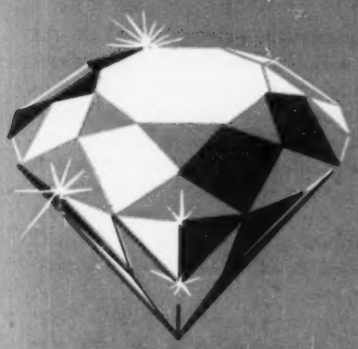
**Hamilton Rubber Mfg. Corp.**, Trenton 3, N. J.: A, B.

**Johnson Plastic Corp.**, Brown & Stafford Rds., Chagrin Falls, Ohio: A, B, E, F, G, H, I, J, K, L, M, N, O, P, Q, S, T, U.

**The Plastex Pipe and Extrusion Co.**, 402 Mt. Vernon Ave., Columbus 3, Ohio: A, B, C.

**Plastipipe, Inc.**, 5544 W. 104 St., Los Angeles 45, Calif.: A, B, E, F.

It is also pointed out by the U. S. Gasket Co. that Section R, covering fluorocarbon pipe, should not show standard scheduled dimensions, since on this type of pipe, nominal sizes only are in effect. Resistoflex Corp. points out that the temperature range listed under the physical properties of the fluorocarbons is far in excess of that recommended. Also, maximum working pressures for the fluorocarbon pipes and fittings are declared to be too high. Prospective users of fluorocarbon pipe are advised to check manufacturers on details of the application.



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*Cascade is different . . . it's precipitation hardened*

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# Do-It-Yourself

(*From page 93*)

of molded plastic tile is styrene, which in the period since World War II has grown to become an important factor in the tile field, not only for modernization programs but also for original installations (see MODERN PLASTICS, June 1954, p. 181). In addition to molded styrene tile, available in a wide variety of colors, patterns, and sizes, several types of vinyl tile are also available.

Qualities which endear plastic wall tiles to the amateur installer include their almost limitless decorative possibilities, wide color range, ease of cleaning and maintenance, inherent color, resistance to most common types of household stains, ease of installation, and modest long-term cost.

An excellent example of how one plastics wall tile manufacturer has approached this market is the do-it-yourself kit for styrene wall tile recently launched by Earl Fisher Plastics Co., Columbus, Ohio. Included in this kit is enough Lustrex styrene wall tile to cover 52 sq. ft. of wall area, together with all the necessary mastic, grouting cement, a coping saw, chalk and line, tape, mastic spreader, and instruction booklet.

## Tiles Locked Together

Something of a departure from conventional molded styrene tiles is the Pittsburgh Interlock wall tile, sold by Jones & Brown, Inc., Pittsburgh, Pa. This tile is designed with a patented interlocking feature which causes the tiles to nest together in proper alignment as they are installed, locking to each other and onto the wall. This extra convenience feature, the company believes, makes the product ideally suited for do-it-yourself work.

Although originally most styrene wall tile was placed in kitchen and bathroom areas, the introduction of larger sizes and special surface treatments has opened up fresh decorative possibilities for the product and made it adaptable to other parts of the house. Thus, Wilson Plastics, Inc., Sandusky, Ohio, has introduced its new Panelux, measuring 6⅜ by 8½ in. and described as a "decorator's size" plastic tile for covering large all-over wall and ceiling areas in den, recreation room, utility room, hallways, children's rooms, and other parts of the house.

New Plastic Corp., Los Angeles, Calif., recently announced Paneltile as an addition to its regular line of styrene tile. Made in individual 9 by 9 in. squares, Paneltile is molded with a textured striated front surface that does not scratch or mar easily and a "sure-grip" diamond back which facilitates installation. The striated surface of the tile was especially designed to complement modern interior decorating trends. Supplied in 11 popular colors, the tile can be installed over any firm, smooth sealed wall surface, such as plywood, sheetrock, etc.

## Sticks Like Paper

With the introduction of suitably backed vinyl sheeting and pre-cut vinyl tiles, the home handyman now has at his disposal a completely new type of wall covering combining ease of installation with a wide choice of colors and textures. Equipped with a bucket of wallpaper paste and a couple of brushes but no special skills, the amateur can easily cover a wall with new fiber-backed Sealtron from the Jason Corp., Hoboken, N.J., which sticks to the wall like paper but outlasts it many times and can easily be kept clean by occasional wiping with a damp cloth. The incorporation of various embossed designs in the vinyl sheeting opens up new decorative approaches in the form of textured walls having their own distinctive character. The material is available in 54-in. widths in a number of colors and patterns.

**"Although originally most styrene wall tile was placed in kitchen and bathroom areas, the introduction of larger sizes and special surface treatments has opened up fresh decorative possibilities and made it adaptable to other parts of the house."**

Bolta Corp., Lawrence, Mass. has two entries in the vinyl wall covering field; Bolta Wall and Bolta Wall-Tile, both consisting of textured vinyl sheeting laminated to an asphalt-treated paper (MODERN PLASTICS, June 1954, p. 164).

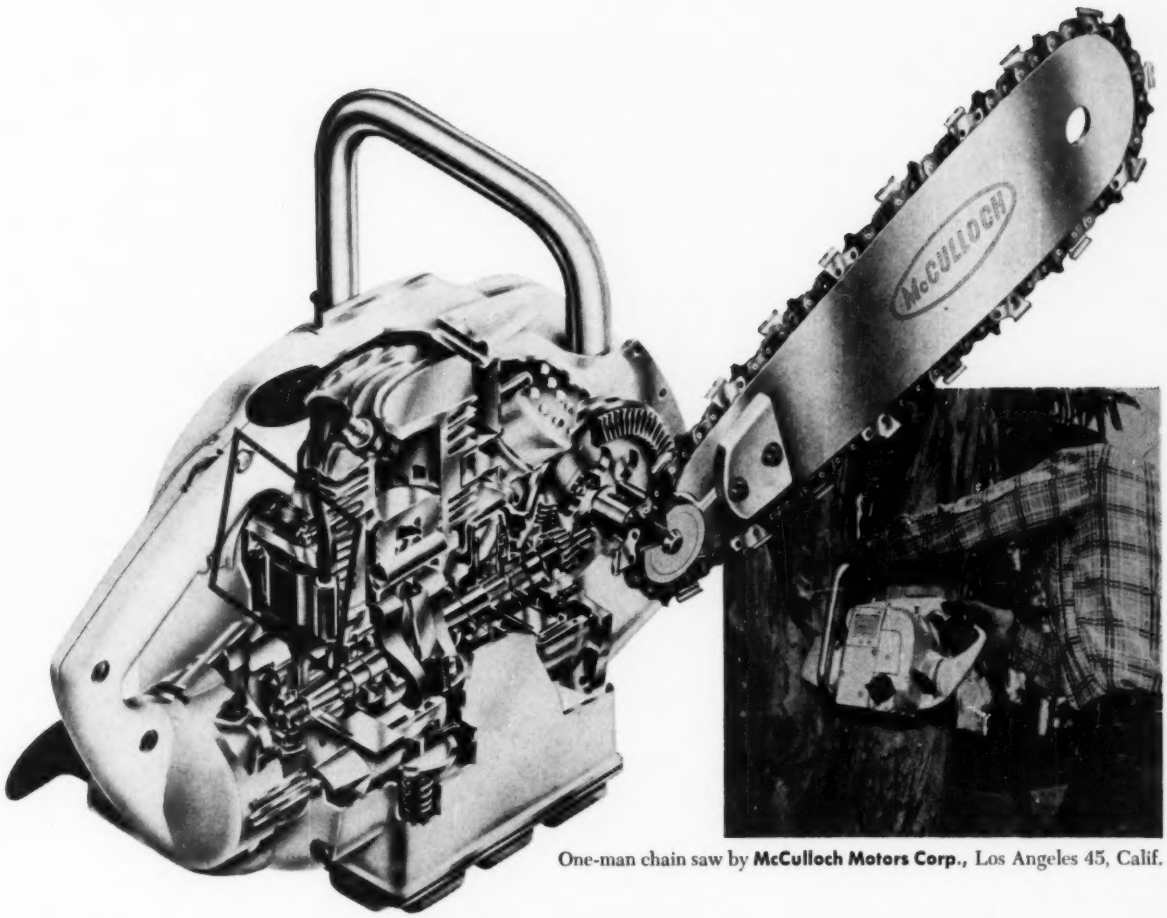
Bolta Wall, supplied in continuous lengths, is intended primarily for professional application, although with due care amateurs can turn out a creditable installation. Bolta Wall-Tile, on the other hand, made in 8-in. squares, is ideal for the home craftsman. Its flexibility permits conformation to minor irregularities in the basic wall surface, while the fact that it may be easily trimmed with scissors permits it to be easily fitted around switch plates, electrical outlets, etc.

Both these Bolta products are applied to the wall with specially developed quick drying cements. For the wall tile, a color filler is used to fill in any gaps between the tiles. On inside and outside corners, matching strips of the vinyl surfaced material are supplied which are folded and cemented in place prior to installation of the individual tiles.

## Sprinkler Systems

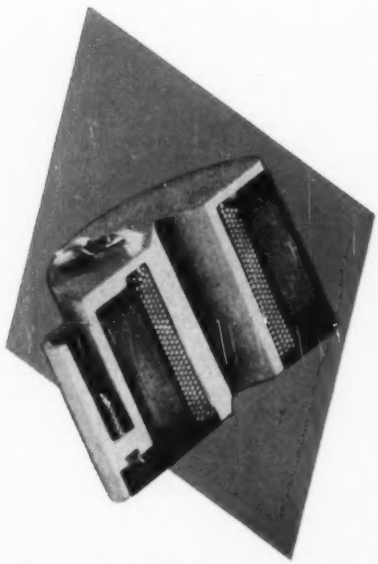
Many a home owner, contemplating his dried-out lawn after a period of rainless weather, has longed for a built-in sprinkler system which would insure even distribution of water whenever he wanted it—at the turn of a faucet. Thanks to plastics, and the development of an ingenious new kit sold by Hi-Spra Corp., Los Angeles, Calif., such a system may now be installed at modest cost on a do-it-yourself basis. The Hi-Spra sprinkler kit is a completely packaged unit containing all the necessary plastic pipe and fittings—all molded or extruded of cellulose acetate butyrate—brass valves, and a 4-oz. can of Hi-Spra plastic pipe weld solvent.

The parts are used in conjunction with brass and chrome pop-up type spray heads which retract flush with the surface of the ground when the system is not in operation. The handy man assembles the system on the lawn, cutting the plastic pipe where necessary to meet the dimensional requirements of the yard. This is easily done with a regular hand saw; no special tools are required. Next the plastic parts are solvent welded for leakproof joints; since the fittings are molded of clear transparent material, it is easy to inspect the joints and make certain they are secure. The metal sprinkler heads are then screwed on by hand and the system tested for leaks. The final step consists of cutting the sod open, pressing pipe and fittings firmly into place with the spray heads level with the ground surface




One-man chain saw by **McCulloch Motors Corp.**, Los Angeles 45, Calif.

# HERE'S WHERE EPOXY RESINS PACK A "KICK"



Cross-section of coil shows BAKELITE Epoxy Resins forming dark area. Note how they have filled crevices between the finest wires.

Wet weather, cold weather, high altitudes or low, the motor in this tough little 20-pound chain saw is sure to start. Safely embedded in a solid block of BAKELITE Epoxy Resin, its magneto and coil stay in permanent working order.

BAKELITE Epoxy Resins are superior materials for such demanding potting and encapsulating jobs. The liquid resin, mixed with its liquid hardener, is poured into place. It fills every tiny crevice. In a few hours at room temperature, it changes into a permanently hard solid. There is practically no shrinkage. The smallest components are set firmly and immovably.

When hardened, BAKELITE Epoxy Resins are extremely tough and strong. They are resistant to moisture, oils and greases, chemicals, most acids and strong alkalies. Their dielectric and adhesive properties are excellent. They are relatively light in weight.

In addition to electrical applications, these properties make them useful for casting jobs, such as automotive tools and dies, for reinforced molded and laminated articles, and for adhesives.

Learn more about them by writing Dept. XR-13.

**BAKELITE**
TRADE-MARK
**EPOXY RESINS**

TRADE MARK
**BAKELITE COMPANY**
*A Division of*
*Union Carbide and Carbon Corporation*
UCC
**30 East 42nd Street, New York 17, N. Y.**




Garden hose extruded from BAKELITE Elastomeric Vinyl Plastic by **Yardley Plastics Co.**, Columbus 15, Ohio.

You can take this garden hose as an example of the production, sales and service advantages found in products extruded from BAKELITE Elastomeric Vinyl Plastics. One reason why this garden hose has been so successful is that it's so attractive—a glossy, transparent green. Since it's extruded from BAKELITE Elastomeric Vinyl Plastics, it will keep this handsome appearance for years. And it's so light, a child can carry a 50-foot length.

These extrusion materials are easy to fabricate, can be given a wide range of colors, and will resist chemicals, oil, aging, climate extremes.

BAKELITE Elastomeric Plastics are being used for many decorative and functional applications—women's belts, auto weatherstripping, typewriter platens. They have excellent dielectric properties, demonstrated by 15 years' successful use as insulation for electrical wire and cable. For information and help in applying them to your product ideas, write Dept. XW-13.

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Belleville, Ontario

and pressing the sod back into position. No extensive digging or defacing of the lawn is necessary with this system.

## Freeze-Proof

Light weight is one of the obvious advantages of this plastic sprinkler system. In addition, the flexibility of the butyrate pipe enables the installer to work his way around horizontal or vertical obstructions, while its non-metallic nature means that the entire system is immune to corrosion, rusting, etc., to which most types of metal pipe are subject. The fact that the plastic material will expand instead of bursting if water is left to freeze in the system makes a year-round permanent installation possible.

The attractive store merchandising unit from which the kits are sold calls the attention of the prospective buyer to these advantages of the plastic pipe and fittings.

Another type of plastic lawn sprinkler system recently placed on the market, which is laid out on the lawn instead of being placed beneath ground level, comes in lightweight units 50 in. long. Each is a completely self-contained sprinkler or add-on section which will water a 100 sq. ft. area. The units consist of ¾-in. pipe extruded from green Tenite II butyrate plastic and equipped with standard brass garden hose fittings. Perforations in the pipe sections generate a spray of tiny droplets. The Genco units, made by General Plastics Corp., Marion, Ind., are available singly or in a standard package of eight. A spring grip foot pad for sprinkler control is included with each unit.

## Upholstery Kits

Both within and outside the home, the versatile vinyls are available in many forms useful to the do-it-yourself minded man or woman. Owners of folding lawn chairs, for example, may now purchase woven Firestone Velon (saran) re-covers for the chairs which give them new beauty and will far outlast the original canvas covers. The sturdy covers are sold with simple instructions easily followed by even the most unskilled handyman. Woven Velon replacement webbing for tubular metal chairs is also available in several attractive colors.

Perhaps of more direct interest to the ladies is the use of vinyl sheeting as a replacement upholstery material in the home. Through department stores and other retail outlets (even some drug stores) consumers are now able to purchase packaged kits containing sturdy sheets of vinyl material and complete instructions for applying it as a replacement for chair upholstery. Alliance Mat Corp., New York, N.Y., last year introduced, through its Fruit-of-the-Loom Division, precut squares of its Vinyloom upholstery fabrics in eight textured patterns. The deeply-molded 19 by 19 in. squares of Vinyloom can be used, according to the manufacturer, to re-cover a small occasional or kitchen slip-seated chair in approximately 15 min. with a hammer and tacks. Use of a staple gun cuts the time to about 10 minutes. The hundreds of air pockets in the deeply textured vinyl material provide a resilient seat cover that is not slippery in cool weather or sticky in hot weather.



Courtesy The Meyercord Co.

**To give new wood grain finish to unpainted furniture, plastic transfer film is cut to size (left), immersed in water, and then cemented directly to the wood (right)**

## Scarves and Lace

Also appealing to the feminine element are the quality vinyl scarves and sectional lace which may now be turned out at home by using a richly embossed vinyl material manufactured by Hedwin Corp., Baltimore, Md. Based on Goodrich Geon resins, the plastic is available in 14- by 44-in. scarves, or by the yard. With a pair of scissors and a little ingenuity, housewives can fashion their own placemats, doilies, runners, and chair and vanity sets.

With vinyl film widely available as yard goods in department and variety stores throughout the nation, in every conceivable color, pattern, and texture, the list of items which the enterprising homemaker can fabricate for herself is limited only by her own ingenuity. Beach bags, garment bags, table covers and rain hoods represent only a few examples of what can be accomplished.

In this connection, a new vinyl repair kit, consisting of a tube of VC-2 vinyl cement plus four vinyl patches in clear, red, blue, and yellow, was recently introduced by Schwartz Chemical Co., Inc., New York, N.Y., for use not only in fabricating new products but also in repairing torn or punctured raincoats, shower curtains, and other products fabricated of vinyl film. The cement, widely used by the toy industry, is said to produce a bond as strong as the plastic itself.

## Bathtub Seals

Several manufacturers are now selling packaged kits containing an elastomeric vinyl extrusion designed to seal the troublesome joint between bathtubs and bathroom walls. Included in the kits, along with detailed instructions, are a supply of cement for bonding the plastic material to the tub and wall and a solvent for removing excess adhesive after the job is completed.

When it comes to outdoor applications, the do-it-yourselfer finds that woven saran screening, with its remarkable weathering resistance and non-staining properties, can

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save him many headaches for either original or replacement screens. The material is easily cut to size without special tools and applied to screen frames. Since the material has a tendency to pull itself taut after being applied to the frame, a tight installation is easily achieved.

### Decorative Combinations

Homeowners with a decorative flair can let their imagination run riot in working with Panlam and Polyplastex Synskyn, products of Polyplastex United, Inc., New York, N.Y. Panlam consists of a combination of Krene vinyl plastics with various types of fabrics, fibrous glass, unwoven fibres, botanical species, and other products, while Synskyn is an artistic blending of the same vinyl resins and an unwoven jackstraw pattern of fibrous glass.

Both materials are easy to cut with shears and may be punched, perforated, stapled, tacked, or laced. In addition, they may be cemented to themselves or to wood, glass, metal, etc., with Polyplastex No. 201 adhesive. The materials are used for a variety of do-it-yourself projects ranging from lampshades, screens, and table decorations to room dividers, displays, and many other items.

### Lacquers

Unpainted or old furniture as well as metal cabinets, walls, etc., can easily be given a completely new and attractive appearance by applying a decorative plastic lacquer film now available from several manufacturers. As produced by The Meyercord Co., Chicago, Ill., under the trade name of Plastic Veneer, this material is made by a new photographic process which makes it possible to capture the grain and beauty of rare woods, marble, and other materials. Available in 18 wood grains and marble patterns, Plastic Veneer is supplied in the form of paper-backed sheets which are easily cut to the required size and then immersed briefly in water so that the thin film carrying the pattern can be slid off like a decal and transferred to the surface to be covered. A special type of slow-drying adhesive is used which permits the film to be shifted around to exact position before setting. After being allowed to dry for 48 hours, the film is then protected with a coat of

varnish and wax for increased durability.

For the hobby enthusiast, plastics offer a wide range of outlets for his creative energies, ranging from polyester resin casting kits to prefabricated scale models of boats, trains, and every vintage of automobile from the gas buggies of half a century ago to the latest streamlined dream cars. Those interested in internal carving and other plastic fabrication enjoy working with acrylic sheets, rods and tubes, while extruded vinyl strips are available for those whose preferences lean to weaving and similar work.

## Anti-Corrosion

Various types of acrylic sprays in aerosol type cans give the home craftsman a handy new way of protecting metal against corrosion. Specially formulated aerosol sprays based on selected plastics are now also available for waterproofing ignition systems, coloring various types of surfaces, waterproofing fabrics, and protecting artwork against smudging. One of the newest products along this line is Fab-Spray, a plastic resin base mineral pigment spray designed for use on draperies, furniture, rugs, auto interiors, etc. Available in 15 decorator colors, this product is said to beautify fabrics without altering their texture. The manufacturer claims the material also penetrates the fabric without clogging the pores and restores a springy, new feel to the nap or pile.

## Polyester Laminates

An entire new category of do-it-yourself projects has been opened up for the home mechanic with the development and marketing of polyester resin-fibrous glass laminates in the form of flat and corrugated panels. With these colorful, durable new materials, easily handled without special tools or skill, rank amateurs are turning out their own translucent awnings, porch and patio roofs, skylights, entrance canopies, and a host of other projects. They have found the materials ideally suited to interior lighting applications, room dividers, and numerous other products for which no equally suitable material has previously been available.

Such panels, made by a number of manufacturers, are now finding increased distribution through mail


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order houses, lumber yards, and other retail outlets catering to the growing demands of the do-it-yourself market.

Recognizing that household awnings mark one of the largest potential outlets for the fibrous glass-polyester sheet material, Alsynite Co. of America, San Diego, Calif., recently introduced a do-it-yourself kit containing all the necessary materials to construct such an awning and its supporting metal framework.

With many manufacturers now turning out small boats having glass fiber laminate hulls, it is not surprising to find various firms offering kits for making wooden boat hulls watertight by covering them with a fibrous glass-polyester skin. Most kits in this category include a ready-mixed resin with unlimited shelf life and a supply of glass cloth (MODERN PLASTICS, May 1953, p. 95). According to these manufacturers, the fibrous glass skin can be applied in the morning and the boat placed in service the same day. By protecting his boat with materials of this type, the owner can cut upkeep and repair bills and greatly prolong the service life of his craft.

A number of manufacturers who have been active in the construction of polyester-fibrous glass auto bodies are now selling the bodies separately to enthusiasts desiring to build their own sports cars. One of the most active firms in this field is Ketcham's Automotive Corp., Chicago, Ill., which produces a well designed 3-passenger one-piece reinforced plastic body designed for use with a special K-type frame, a 1942-48 Ford running gear, and most V-8 engines. The bodies are supplied unpainted, along with a choice of six colors which the buyer may apply himself after mounting the body on the frame and completing the car with his own choice of interior and accessories. Within two or three weeks, the do-it-yourself mechanic can have a sturdy, high-performance sports car on the road at a saving of hundreds of dollars. The car is also available in finished form for those not wishing to do the work themselves.

The combination of fibrous glass and polyester resins also gives the home handyman a versatile new material with which he may make numerous repairs around the house (on leaking pipes, gutters, etc.) as well as patching rusted spots in auto bodies, customizing by covering seams, etc. Among the companies which have developed special kits for this purpose is the Multiplastics Div. of Curd Enterprises, Inc., Franklin Park, Ill. The "Kustomize" kits offered by this company, includes supplies of glass cloth, cans of polyester resin, hardener, etc., along with full instructions. Using these kits, even an unskilled worker can make his own removable hardtop for a convertible, dechrome a car and fill all openings smoothly with a permanent, non-rusting material, "French" the headlights, and accomplish a number of other customizing operations which give his car an entirely new custom appearance.

## Markets Unlimited

From tabletops to automobiles, from bathroom walls to patios, from floors to ceilings, is the scope of the do-it-yourself market for plastics. Every home owner is a prospect. The easier the plastics industry makes it for the home mechanic, the more profitable the home mechanic will make it for the industry.—END


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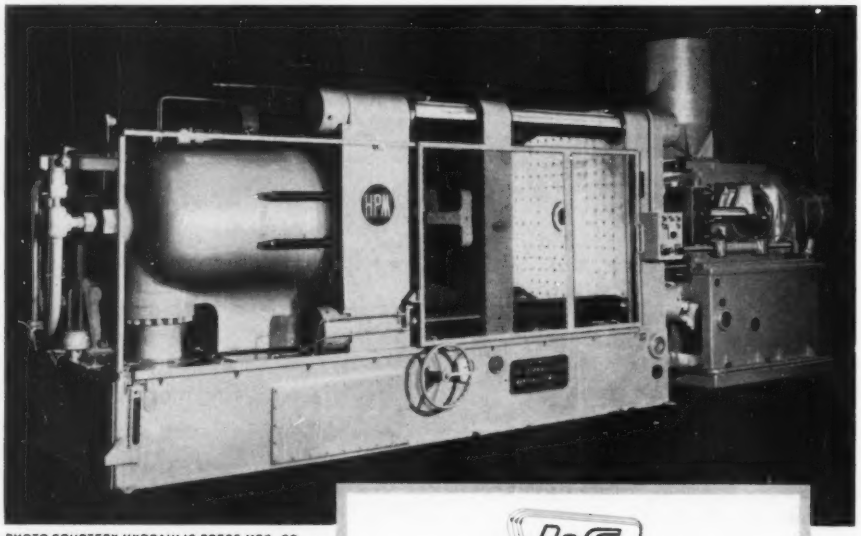



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# Coloring Acrylic

(*From page* 100)

tion different from that obtainable by either type of technique alone.

The white translucent or opal forms of acrylic sheet and molding powder are very important. These materials are available in a range of light transmittances from less than 10 to about 85% of the incident light. Their lighting efficiency is extraordinarily good; very little energy is wasted by absorption. The key to success is selection of a transparent light diffusing pigment with the proper refractive index and precise control over particle size. This provides a multitude of scattering surfaces and practically no absorption. The lower transmittances are achieved by using titanium dioxide in combination with the coarser diffusing pigments such as the barium salts. The white translucent materials have found wide acceptance in outdoor and indoor signs, letters, skylights, lighting fixtures, and luminous ceilings.

The advent of color, the development of plastic formulations suitable for extrusion, and the recent advances in width and quality of extruded shapes have given designers a great latitude in solving lighting problems. The white translucent acrylic materials are particularly good for these purposes because of their non-yellowing characteristics, their dimensional stability, and their fidelity of color and transmittance.

## Color Applications

Back-lighted translucent signs are among the most important fields in which colored acrylic plastics are used. In these applications, formed or fabricated letters of one color can be attached to background panels of a contrasting color, and the entire sign face lighted from behind (or interior-lighted in the case of a double-faced sign) to create an attractive, durable means of conveying advertising messages. One example of this type of sign is the Esso service station sign, in which red letters are cemented over a blue-bordered white translucent sheet.

For other sign applications, the background sheet can be cut out, behind cemented box-type letters, to improve the brightness and hue of the letters The popular Shell and Tydol signs exemplify the results of this technique. Many signs are also made by painting directly onto the back of colorless transparent sheets, using stencil or screen techniques. In some cases, colored background sheets—white, tan, yellow—are painted on the first surface with legends and designs in contrasting colors. Many of the best known acrylic signs involve matching proprietary colors long associated with particular products or trademarks. The acrylics are ideally suited for faithful renditon and permanence of these colors in a plastic medium.

## Architectural Uses

In addition to signs and lighting, other architectural uses of colored acrylics include glazing and daylight control panels and chalkboards. Smoky greys which are transparent for the desired "spacious" effect, but shaded for glare reduction, are used for glazing in schools and industrial buildings. Translucent blue greys have been successful in control of morning and afternoon direct rays from the sun.

**The argument as to which color has the highest degree of visibility is one that recurs constantly. The U. S. Navy is now considering a change from yellow to bright scarlet as the color for inflatable life-rafts.**

Acrylic chalkboards, now available in a variety of colors specially developed to harmonize with modern school interiors, illustrate another appearance attribute related to color-surface textures. While most acrylic products have glossy surfaces, the chalkboards are produced with a matte finish to improve visibility and to facilitate writing on the board. Similarly, pebbled and matte surfaces have been used on indoor signs and various lighting applications where gloss might be objectionable. A wide variety of colored textured surfaces can be made by sandblasting, embossing, molding, calendering, or direct casting. The texture changes the color of the acrylic, making it somewhat lighter and less intense.

Aircraft canopies produced during World War II were the most spectacular use of acrylic plastic sheets. Most of these were colorless. Recent developments include colored canopies and also green tints for commercial plane cabin glazing. Other colored applications in the aviation field include identification filters, marking panels, compartmented food trays, and gold tone mirrors.

## Automotive Applications

The automotive applications of colored acrylics are many—and the number is increasing every year. Most of the colored tail light, reflector, and signal lenses are now injection molded of acrylic. The advantage of reduced breakage is obvious, but the improved optical efficiency and the precise control of color to S.A.E. or customer specifications were the real keys to success.

Smoky green windshields and external visors made of acrylic sheet and molding powder were pioneers in the transparent visor field. In this development, it was necessary to formulate greens, tans, reds, and blues, all of which had to be haze-free, low—but carefully adjusted—in visible transmittance and, of course, recognizable and attractive as distinct colors. A special problem was to select colorants that would permit traffic signal colors to be clearly recognizable through the various visor colors. The visor developments paved the way for production line use of large transparent colored top sections on two major 1954 automobiles.

The important field of personal accessories was the earliest large-volume application of colored acrylics and it is still growing in importance and variety. The delicate jewel-like tints possible in thick sections of acrylics are widely used in quality hair brushes, combs, and mirrors. Ladies' handbags, picture frames, trays, decorated bowls, and many other artistic creations are made from colored stock and by external dyeing of colored or colorless plastic. The external dyeing is done with dyes of extreme strength which are dissolved in a solvent mixture and carried into the plastic by diffusion of the solvent. Pearlescent sheet is widely used for jewelry, buttons, and other personal accessories.—END

# Polyethylene

(*From page* 105)

ene. This can be determined by placing the sample in contact with a finely ground glass plate and noting the wetting of the glass. Some amine derivatives employed as weathering stabilizers have these characteristics. In some instances spewing brings non-migrating colorants to the sample surface. Although this has been attributed to crocking, this claim is erroneous.

**Reactivity of Colorants**—Reactivity of a colorant with the resin generally results in odor development or embrittlement or both. This reaction is not generally evident when the formulation is made but develops during a period of storage. Often, heat speeds this reaction.

Reaction occurs when oxidizing materials are present. Small amounts of manganese or cobalt either in chemical combination or as an impurity, promote this reaction. Some inorganic colorants having tightly held manganese may be satisfactory but should be checked. Hydrated chromic oxide is unsatisfactory since formulations containing it become brittle on storage. Iron blues promote odor and embrittlement.

**Heat Stability of Colorants**—Some colorants break down when heated in polyethylene formulations. This may result in fading, darkening, or a hue change. In some instances there are secondary reactions of the resin with the degradation products of the colorant. A colorant which is used for general application must withstand a material temperature of 590° F. for three minutes. This temperature eliminates most of the organic colorants which have acceptable migration and reactivity characteristics. In addition, many inorganic colorants fail at this temperature. Satisfactory colorants are listed in Table I. (See p. 104.) This group is illustrative and should not be construed as representing the only colorants acceptable for polyethylene. Alternate colorants should have parallel performance. This particular section is presented because the colorants have been tested. Table II (see p. 105) includes colorants having acceptable performance for general application. However, these colorants have limited use for color matching purposes. Table III (see p. 105) includes colorants which are generally satisfactory except that they must be used at reduced temperatures.

**Weathering Characteristics**—Brown and black colored formulations have been markedly effective in upgrading the weatherability of polyethylene. The brown formulation contains chrome molybdate orange and carbon black. The black formulation contains 3% of a medium color channel carbon black. The colorant or mixture of colorants protects the resin by excluding the light. The choice of a colorant, its concentration, particle size, and degree of dispersion is critical for this application. The details concerning carbon black formulations are reported in available literature.[1,2]

Weathering failure of the resin is characterized by crazing. Brown formulations craze with less weathering exposure than black formulations containing 3% of carbon black. However, carbon black affects the dissipation factor of the polyethlene formulation to a greater extent than the brown. The black formulation has a higher initial dissipation factor and is a poorer material electrically at TV frequencies than the brown, even after a period of weathering. These comparisons were made before crazing developed in the brown formulation. In many instances there is a definite problem involving the balance between optimum weathering and electrical characteristics.

Other colorants afford little or no weathering protection to the resin. The colorants included in Tables I, II, and III have as good weathering stability as the resin; that is, they neither upgrade nor downgrade the weatherability of the resin. However, it is important to note that small concentrations of colorant or formulations containing tints in the pastel range have limited light stability; they generally fade. Weathering tests are made on all colored formulations to eliminate colorants which have adverse effects on the weatherability of the resin.

**Low Temperature Brittleness Characteristics**—Unpigmented polyethylene has excellent low temperature brittleness characteristics, as measured in accordance with A.S.T.M. D-746-52T. Additions of colorant in concentrations of less than 2% effect these low temperature brittleness characteristics at temperatures below —49° F. only slightly but do not affect them at or above this temperature. All of the colorants recommended for general use can be considered to be in this classification.

**Electrical Characteristics**—The electrical characteristics of polyethylene are modified by the addition of colorants and since electrical applications are diversified, color studies are necessary to deal with specific problems. In critical applications the addition of small amounts of colorant adversely affects the dissipation factor of the formulation at some frequency. The quantity of color, its type, and dispersion, all contribute to its over-all effect on the dissipation factor.

**Color Quality and Practical Considerations**—The color quality of the finished formulation is a function of the technique of dispersion and variation of the raw colorant. The technique of dispersion can be selected to give the desired results. The variation of the raw colorant can be evaluated against a specification. The color characteristics of the colorant can be checked through masstone and tinting strength determinations similar to those used in the paint trade. Determinations based on spectrophotometric data have proved extremely reliable.

Colorant specifications for extraneous material having large particle size are often required. They are particularly important in the production of thin films or monofilaments since large particles will interfere with the operation of the equipment or seriously affect the resulting product. Coarse particles can be studied by determining the amount of residue on a 325-mesh screen and examining it under a microscope.

Practical considerations in the application of colorant to any product must take into account the finished thickness. In some instances, the amount of colorant required to produce a given color in a thin section is prohibitive either from the standpoint of economics or its effect on the physical characteristic of the product.—END

[1] "Weathering and Crack Resistance of Black Polyethylene for Wire and Cable," by W. A. Haine, E. F. Smith, N. R. Smith. Electrical Engineering *71*, 1113 (Dec. 1952)

[2] "Weathering Studies on Polyethylene: Wire and Cable Applications," by V. T. Wallder, W. J. Clarke, J. B. DeCoste, J. B. Howard. Industrial and Engineering Chemistry *42*, 2320 (Nov. 1950)


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# Vinyl Colorants

(*From page* 106)

generally good in heat stability and lightfastness. They are usually employed in plastics requiring bright yellow and orange colors except when lead-free products are necessary. They are non-specific as regards stabilizers and lubricants.

Iron oxide pigments are low in cost and not very bright, but they are useful in many vinyl formulations. They do not bronze, crock, or migrate and generally have good heat and light stability. They must be stabilized carefully to reduce the tendency to form ferric chloride from the chlorine in the vinyl. Ferric chloride acts as a catalyst for further decomposition. Small percentages of iron oxides in vinyls may be more difficult to stabilize than large amounts.

Cadmium pigments are extensively employed in vinyl plastics. They do not bronze, crock, or migrate and have good heat and light stability. They are not specific as to stabilizer or lubricant.

Phthalocyanine blues and greens are excellent pigments for vinyls with little bronzing, crocking, or migration. They possess good resistance to heat and light and generally do not require specific stabilizers.

The organic yellows, oranges, reds, and maroons present the most serious stability problems and many are quite specific in stabilizer and lubricant selection for optimum performance. Some of them tend to bronze, crock, and migrate and are limited in heat and light stability even under the most favorable formulating conditions. In many cases two or more stabilizers are needed.

## Stabilizers

In general, lead stabilizers should be avoided with pigments of limited lightfastness. Cadmium, tin, and barium salts are among those most likely to be effective.

For maximum resistance to bronzing, crocking, and migration, grease lubricants should be kept low and inorganic stabilizers should be used.

For maximum heat resistance, inorganic stabilizers are generally preferred, although tin and cadmium organics are sometimes effective.

Pigments containing manganese, zinc, magnesium, cobalt, copper, chlorine, and small amounts of iron or free sulfur often accelerate decomposition unless the compound is effectively stabilized. Pigments containing tin, calcium, barium, cadmium, and lead, as previously mentioned, usually do not harm stability and may, in fact, improve it.

Some stabilizers tend to affect the tinctorial properties of pigments in vinyl plastics. For instance, basic lead carbonate is a white pigment which acts like titanium dioxide in reducing the value of colored pigments. Such effects on tinctorial properties are not objectionable provided the colors desired in the finished plastics are obtained and the product has the stability required.

## Dispersion

The dispersion of pigments is a serious problem. Agglomerates must be broken apart and dispersed to their primary particles as completly as possible or streaks may be visible in the finished plastics. The manufacturer of plastic products may buy his pigments in dispersed form from concerns which specialize in such work or he can disperse them himself. Tumble mixing of dry colors with resin granules is generally not a very effective method of dispersion unless the pigments are specially processed.

When processors prefer to do their own dispersion, ball mills generally give the best results, since even very adherent agglomerates of primary pigment particles may be dispersed by the impact of the balls in these mills. The liquid in ball mill bases may be monomeric plasticizer with a little polyester plasticizer added to perform the function of a wetting agent. Kneader type mills also are quite effective except that their shearing action does not thoroughly disperse very hard agglomerates in some instances. Three- or five-roll paint mills are next in effectiveness followed by two-roll plastics mills.

Some of the pigments most extensively used in vinyls are listed in the table on p. 106. Ratings are given for their relative performance characteristics under reasonably good formulating conditions although these ratings may not reflect the optimum in performance which might be attained through detailed studies of stabilizer and lubricant selection for some of the more sensitive organic pigments. The effect of pigments on volume resistivity is given because of the wide use of colored vinyl materials for wire insulation.

The lightfastness under the column headed "Low" in the table is given for small pigment concentrations on the order of 0.2 parts per 100 parts of resin, since such small amounts are often used in the translucent vinyl film made for many purposes. The column headed "High" indicates the lightfastness in pigment concentrations of about 2.0 parts per 100 parts of resin. The column headed "Tint" indicates the lightfastness in pastel shades containing 0.2 parts of pigment, 3.0 parts of titanium dioxide, and 7.0 parts of basic carbonate white lead stabilizer per 100 parts of resin.

Different requirements are necessary for pigments used in vinyl latex coatings and paints. For example, lightfastness and alkali resistance must be good, while heat resistance, migration, crocking, bronzing, and electrical properties are usually not important.

The following pigments are commonly used in latex coatings:

Whites—titanium dioxide, zinc sulfide, and lithopone (the latter two in vinyls which do not contain chlorine).

Blacks—furnace black, lamp black, bone black, and iron oxide.

Yellows—chrome, Hansa, cadmium, and iron oxide.

Orange—cadmium and molybdate.

Reds—alizarine, cadmium, toluidine, B.O.N., and iron oxide.

Maroons—cadmium, B.O.N., iron oxide, and indo types.

Browns—siennas, umbers, and synthetic iron oxide browns.

Blues—ultramarine and phthalocyanine.

Greens—phthalocyanine, chromium oxide, and pigment green B.

Three forms of pigments are used in the manufacture of latex paints. They are: 1) dry toners which are dispersed in regular grinding equipment, 2) water dispersible dry powders which are dispersed by high speed agitation, and 3) pastes of pigments dispersed in water.

• • •

The information and comments on organic pigments given in this paper are based largely on results obtained on Harmon colors because most of the laboratory evaluation studies were made on them.—END

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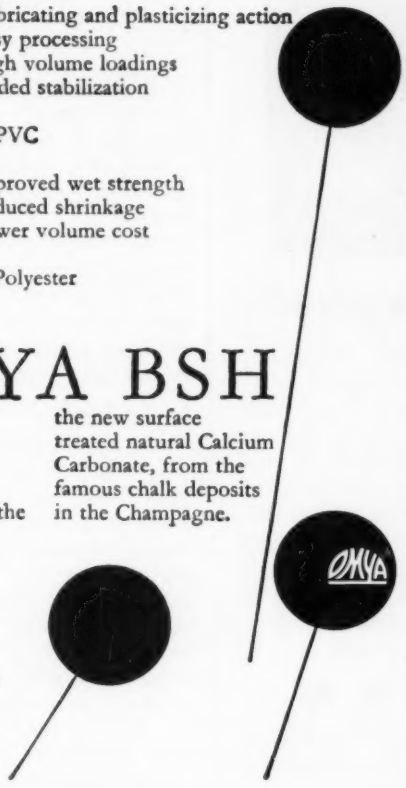
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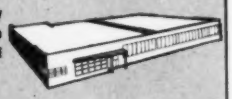
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## Color in Styrene

(*From page* 103)

addition, the plastic panel must be white by both transmitted and reflected light. To satisfy these demands, it has been necessary to find pigments such as finely powdered glass, which will refract or bend light without absorbing or reflecting it to any appreciable extent.

Colors for government applications are often restricted by rigid colorimetric specifications that require a certain amount of reflectance or transmittance at given portions of the spectrum. Unfortunately, most of these specifications are based on colors previously obtained in paint, glass, or textiles. The styrene colorist, not always being able to use the same colorants that were in the original material, must use considerable ingenuity in meeting these specifications.

The introduction of styrene-rubber molding compounds (styrene alloys) has presented additional problems in coloring. The styrene alloys or high-impact styrenes frequently require different coloring techniques because of the color of the base stock. Where regular and alloyed styrenes must be produced in the same colors, completely different colorant formulations are often necessary, since the base stock itself acts as a colorant which must be compensated for in the formulation. Add to this the fact that some modified styrene formulations gradually change color for anywhere from 10 min. to 24 hr. after molding before stabilizing to the final color, and the additional control problems become obvious. Because of the inherent base color of the alloy, it is not possible to obtain quite as wide a range of colors as with regular styrene. Transparent colors, for example, cannot be formulated with styrene alloys.

### Dry Coloring

One of the coloring techniques that has gained considerable acceptance among molders in the last two years is that which is commonly known as dry coloring. Molders utilizing this technique purchase a special grind or particle size of uncolored polymer and color it to suit their various needs by tumbling the uncolored material with a blend of dyes and pigments to obtain the particular color needed. Recent progress by molders, molding compound manufacturers, molding equipment suppliers, and colorant manufacturers has made it possible for the injection molder, by using this dry coloring technique, to produce colored molded products of acceptable quality for certain applications. It is generally recognized, however, that current limitations of this method prevent its use in applications where complete and uniform colorant dispersion, strict color specification, and the maintenance of a very small color tolerance are required. It is believed that these latter features may be only obtained by compounding on an extruder or mill as described above. This dry coloring technique, however, must not be underestimated. It has enabled molders who handle short runs or whose applications do not require precise coloring to minimize their inventory problem. They need simply to stock the uncolored crystal dry colorant grind and prepare the various required colors as they are production-wise needed.—END

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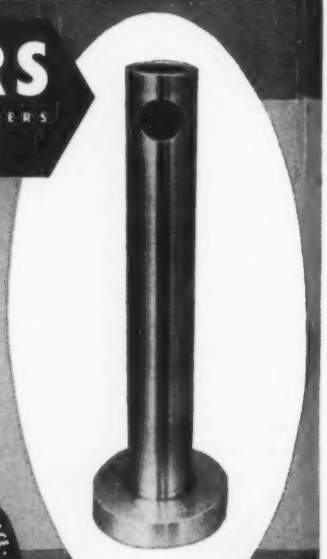
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# Mirrors

(*From page* 107)

application—a vending machine mirror—the desired copy and design were engraved into the back of the mirror, filled with colored pigments, and then covered with the silver backing.

Using Carboloy- or Stellite-tipped cutters, the plastics mirrors can be fabricated in any desired shape. The edges of the mirrors can also be bevelled or entire areas completely routed out.

## Applications

Despite the cost of the plastics mirrors, which is higher than that of glass, the fact that the plastic mirrors will last so much longer than glass, makes them particularly adaptable for use in vending machines, display signs, or wherever more than ordinary abuse is likely to be encountered. In home trailer or airplane applications, the light weight of the plastics mirrors—they are 20% lighter than glass—is another deciding factor.

Durability, excellent optical properties, and light weight combine in also promoting the mirrors for use in the photography, movie, and television fields. One theatre in New York, for example, uses a plastic mirror supplied by Acrylite as part of a projection technique in which the movie is projected into the mirror and reflected back against the screen, instead of directly onto the screen. Reflection properties of the plastic mirror proved superior to glass in this application.

## Special Effects

For achieving special effects in photography or television work, flexible mirrors, as thin as 1/16 in., and capable of being bent without breaking, are also available.

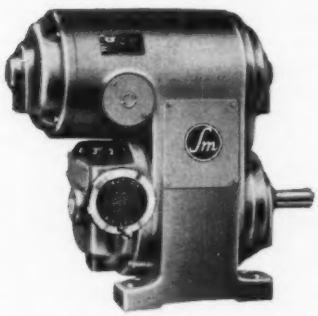
As far as the future potential for plastics mirrors is concerned, Acrylite predicts that while they will at first claim their greatest sales where replacement of fragile glass mirrors is a major cost factor, they will eventually find an equally as profitable market in home or consumer applications that include wall or closet mirrors, compact mirrors, and mirror picture frames.

CREDITS: CR-39 supplied by Cast Optics Corp., Riverside, Conn.

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*Mr. W. J. Johnson, President of Modern Plastic Machinery Corp., leading manufacturer of plastic processing equipment, states that highly versatile, dependable Speed-Trols increased production due to wide speed range, less maintenance and down-time; reduced rejects and improved quality because of accurate, positive speed regulation; saved 20% floor space because of compactness.*

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# 6TH N.P.E.

(*From page* 109)

counted for the bulk of this showing. It was significant, however, that a large amount of floor space was devoted to other glass-filled resins. The several resins of this type on display ranged from glass-filled phenolic, polystyrene, melamine, fluorocarbons, epoxies, and silicones, to vinyl-glass for wire coating, vinyl coated glass yarns for screen cloth, and vinyl garden hose with a lace-like fibrous glass reinforcement.

The remainder of reinforced plastics applications were primarily those that had been in the public eye for several years, including luggage, housings, boats, fishing rods, and automobile and truck bodies.

## OTHER MATERIALS

In the cellulosics field, a new butyrate sheet was announced which has exceptional outdoor weathering characteristics and which is particularly adaptable to the vacuum forming technique in the manufacture of signs and displays. An intriguing display was a reinforced plastics manikin wearing a bathing suit made up of acetate sequins on an elasticized backing.

Urea materials were prominent in gaily-colored urea TV cabinets. While the presence of the cabinets by themselves cannot be considered indicative of a trend, many visitors felt that they were a good sign that the potential of molded urea applications are, perhaps, beginning to be realized by industry.

Polyethylene applications were on display at several booths, and the material itself was the subject of much conversation by those attending the show. There was talk, for example, on the potential of the material; on the question of its increased availability by the end of 1954; on the irradiated polyethylene which is claimed to have better heat and chemical resistance than regular polyethylene; and on cellular polyethylene with half the weight and a dielectric constant about half that of regular polyethylene.

Acrylic, saran, laminates, melamine, and other plastics materials also showed up during the Exposi-


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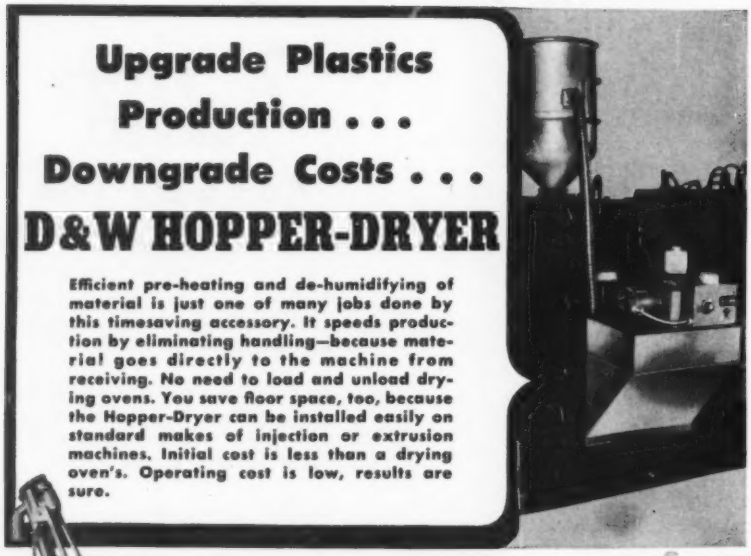
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A Service of **MODERN PLASTICS**
A BRESKIN PUBLICATION
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tion in improved formulations or fabricated or molded into high-quality products. The general consensus, in fact, of exhibitors, visitors, and members of the MODERN PLASTICS editorial team, was that most of the material suppliers placed major emphasis on the quality rather than price. As one of the exhibitors put it: "If the trends at this show are any indication, the plastics industry has reached a phase where the low-cost materials must offer good qualities in addition to price advantages or lose out to something better even though the price is higher."

## FINISHES

No summary of the Exposition would be complete without a description of the advances made in finishing and decorating molded or fabricated plastics parts. The emphasis on glossy, porcelain-like surfaces for styrene copolymer sheet, and on decorator patterns and unusual surface effects, such as "pebble grain," for reinforced plastics structural panels have already been mentioned.

In addition, interest in the metallizing process is definitely on the rise. Two vacuum metallizing machines were in continuous operation throughout the show. Several equipment manufacturers showed cross-sections of their metallizing equipment to interested viewers; several companies displayed a host of interesting metallized products; and one company filled its booth with samples of metallized acetate, butyrate, styrene, and Mylar film in continuous rolls.

Other finishing techniques, including gold roll leaf stamping, printing, engraving, and spray painting, were on display. Manufacturers were also showing interest in a machine designed to paint objects requiring rotation during painting.

Perhaps the ultimate in achieving individuality in plastics products, however, was decorated melamine dishware. In manufacturing these dishes, an impregnated paper-like disk with a pattern printed on it is inserted into the mold during the breathing or de-gassing cycle and is cured directly into the molded dish.

Many excellent jobs of embossing vinyl sheeting for upholstery were




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also exhibited. Several of them were printed so expertly and embossed so deeply that they could not be distinguished from fabrics except upon very close examination.

A word should also be said for the excellent samples shown at the show of improvements in the basic coloring of plastics materials.

## MACHINERY and EQUIPMENT

From a machinery standpoint, the 1954 show had probably the most fabulous display of equipment ever seen.

At least nine injection molding machines, ranging in size from 3 oz. upwards, were busily turning out plastics items, such as 8-oz. tumblers. Some of these machines were working semi-automatically, while others were doing their job on a completely automatic basis.

The equipment ran the gamut from a highly complex electronic unit which separated different colored or contaminated materials into their proper category, through to the vacuum forming machines described above.

There were several mold temperature control units and high frequency preheaters on display and in operation.

Equipment for gold leaf stamping, spray mask cleaning, and automatic printing in one or more colors was shown. In addition to machines for decoration, there were several machines designed to deflash and finish thermosetting moldings.

Special presses for reinforced plastic moldings, granulators and pelletizers of many designs and many sizes, and various extruders were also on exhibit. The latest designs of weigh-feeding were on display.

The list of machines and equipment which filled many of the booths at the Show could actually go on and on—as could any description of the various applications and materials that were shown. By giving this necessarily brief review of the show, the editors of MODERN PLASTICS hope to convey some idea of the excitement which made the 6th N.P.E. one of the best and most successful industrial shows.—END


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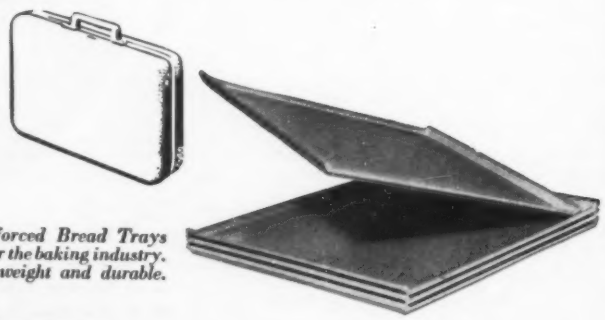
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## Conference

(*From page* 109)

which describes numerous applications of reinforced plastics and the methods used by this company in producing chairs, trays, and large radomes and other aircraft components.

• • •

At the session on new materials, Dr. Gordon M. Kline, chief, Organic & Fibrous Materials Div., National Bureau of Standards, led off with a paper entitled **"Research and Standards for the Plastics Industry."** Dr. Kline's address appears in this issue beginning on page 127.

• • •

**"Expandable Polystyrene Beads—a Unique Plastic Material"** was the subject of a paper by Edwin A. Edberg, Koppers Co., Inc. Moldability, controllable density and shape, toughness, high strength-to-weight ratio, low thermal conductivity, and low water absorption are among the properties of the new material, used for the production of plastic foam. Marketed as tiny beads of styrene containing a blowing agent, the material may be expanded in heated molds into a variety of shapes and sizes in a single operation. Density and strength of the material are controlled by varying the quantity of bead material charged to a mold.

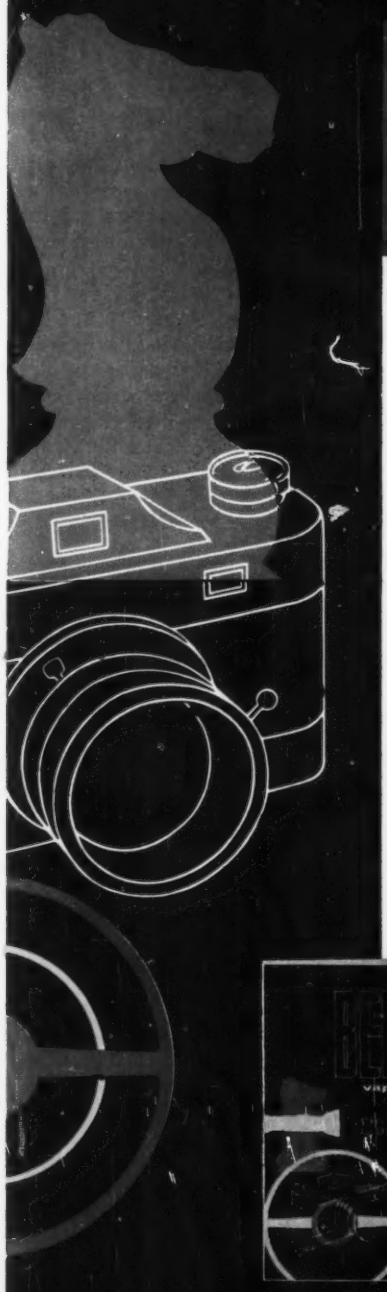
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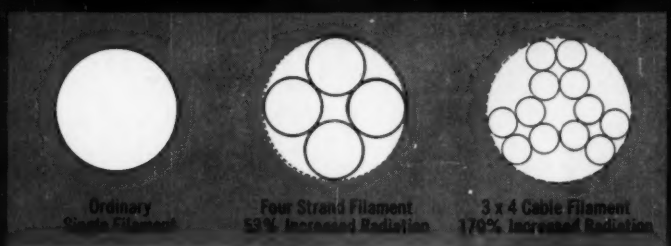
David S. Ballantine, Fission Products Utilization Project, Brookhaven National Laboratory, discussed **"The Effect of Highly Intense Radiation Fields on the Synthesis and Physical Properties of High Polymers."** The speaker pointed out, in presenting the background for his talk, that gamma radiation offers some unique advantages as an initiating agent, in that initiation can be effected at low temperatures where heat-sensitive monomers can be polymerized, polymerizations can be carried out in the solid state, and polymers can be made with no contamination from catalysts.

• • •

**"Flexible Materials—Extrusion and Molding Developments,"** by Frank A. Martin, The Hoover Co., dealt with molding and extrusion of polyvinyl chloride and polyethylene. The basic problem in molding flexible P.V.C. compounds, according to the speaker, is getting sufficient heat

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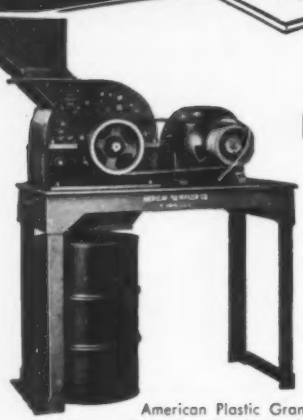



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American Plastic Granulators—available in two sizes, KC9 and KC12—are built for the heavy-duty demands of constant, tough usage. Size, shape, or kind of plastic is no problem for this sturdy machine. The clean, shearing action of the adjustable rotary cutter blades of fine tool steel, provide fast, once-through regranulation.

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into the material to render it moldable without overheating to the point where decomposition sets in. Since cylinder temperatures must be held down and the coefficient of heat transfer is low, the net result is lowered capacity of the machine; some must be de-rated 50% in comparison with their capacity to mold other thermoplastics. Screw-type preplasticizing, combined with the injection process, produces excellent results with this material.

• • •

Presentation of a motion picture, "What's a Silicone?" by Dow-Corning Corp., was part of the session on new materials. The film graphically presented basic information on the composition, properties, and applications of various forms of silicones.

• • •

In a paper by Robert P. Molitor, Sun Rubber Co., having for its subject **"Plastisols—Processing and Application,"** the speaker stressed the new developments involving these versatile materials. Included in his discussion were a review of plastisol applications in toys, industrial parts, and other types of products.

• • •

**"Vinyl Sponge and Foam—Processing and Applications"** was the topic of George R. Sprague, The Sponge Rubber Products Co., whose paper was limited to the open-cell type material. The two basic processes for the manufacture of vinyl foam, as outlined by the speaker, include a patented gas absorption process and the decomposition of certain chemicals through heat, liberating gas with which the vinyl is expanded. In both instances, the frothed plastisol must be fused at elevated temperatures to complete the processing.

• • •

**"Rigid Vinyl and Rubber-Resin Blends—Processing and Applications"** was the topic of George S. Laaff, Bolta Products Div., General Tire & Rubber Co. At present, according to the speaker, twin screw extruders are believed to produce the greatest quantity of salable unplasticized and modified P.V.C. pipe and tubing, although great progress has been made with single screw extruders. High molecular weight emulsion polymerized resins have been found to extrude with ease and the pipe is more likely to be homo-

# DESIGN and PRODUCTION NEWS

FOR PLASTICS AND MATERIALS ENGINEERS

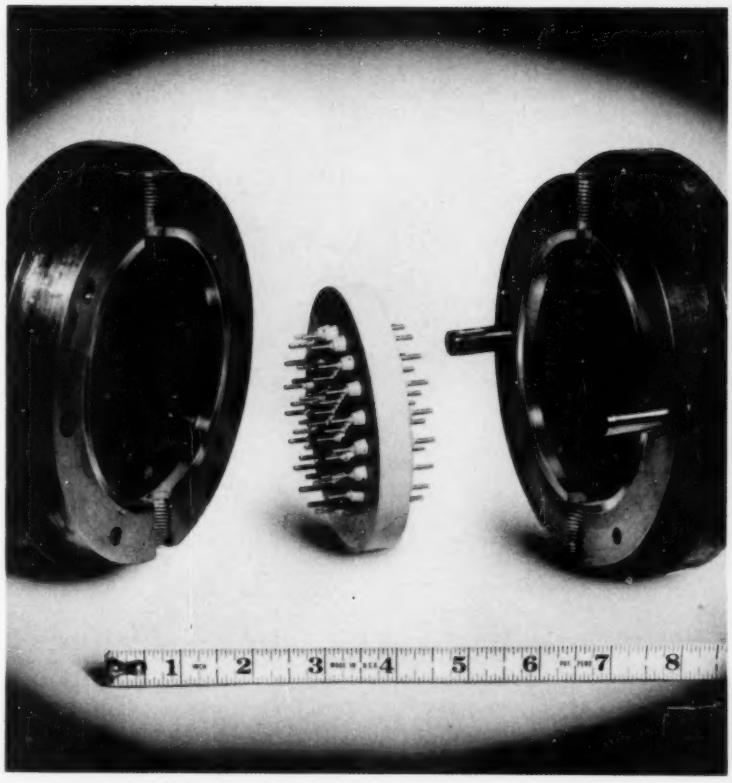
Published by TECHNICAL SERVICE, Chemical Manufacturing Division, The M. W. KELLOGG Company AUG.-SEPT. 1954


# Casting Molds of KEL-F® Polymer Replace Plated Metal Molds... Cut Costs, Finishing and Rejects!

Complex electrical terminal boards, made of an especially abrasive epoxy compound, are now cast in molds of KEL-F polymer, replacing former metal molds. Advantages include lower original mold costs, lower maintenance costs, fewer rejects and higher product precision without extensive machining.

Excellent wear characteristics of the new molds result in longer mold life despite high silica content of the casting resin. The non-hesive properties of KEL-F polymer prevent pitting by the resin, result in damage-free release of the product without special coatings. Penn-Plastics Manufacturing Company, Glenside, Pa., produce these intricate new molds by transfer methods. Molded of KEL-F polymer Grade 300, they are designed to hold 40 terminal pins and to impress forty 1/16" numerals in both faces of the finished part. Terminal boards are manufactured by Penn-Plastics in conjunction with Woodmont Products, Inc., electronic parts manufacturers of Huntingdon Valley, Pa.

***For further information ask for Application Report P-101***





## New Bearings of KEL-F® Polymer Eliminate Shaft Seizing... Need No Lubrication!

Shaft seizing is stopped and lubrication is eliminated when rotating metal plating racks are equipped with end bearings of KEL-F polymer. Chemically inert, the tough plastic bearings are unaffected by the most corrosive cleaning and plating solutions...allow smooth rotation. Bearing "drag" is low because the fluorocarbon is dimensionally stable. It will not swell or shrink in contact with water, steam or chemical vapors.

Kurz-Kasch, Inc., plastic molders of Dayton, Ohio, compression-mold the two-piece bearings from KEL-F polymer Grade 300 for use in plating equipment manufactured by The Stolle Corporation, Cincinnati, Ohio.

***For further information ask for Application Report C-117***

(SEE REVERSE SIDE)

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CONTINUED FROM PRECEDING PAGE

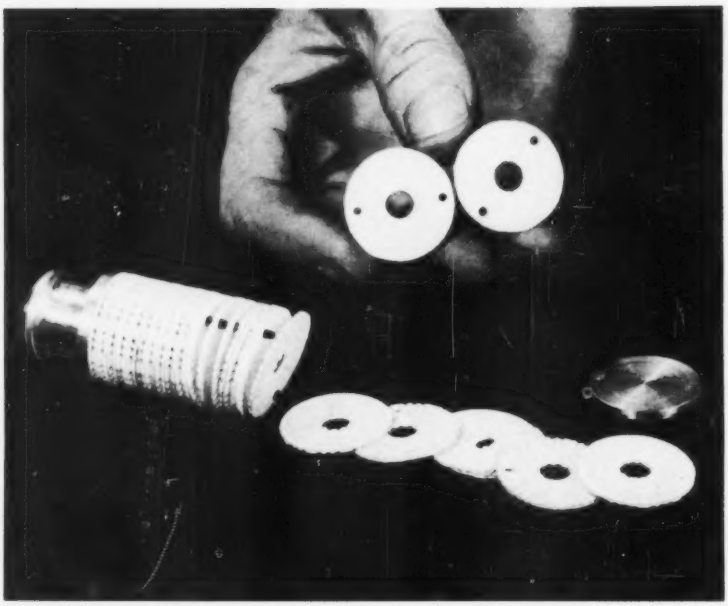
# New Aircraft Fuel and Oil Filter Uses Porous KEL-F® Plastic . . . Gains Increased Efficiency, Longer Service Life

High strength in contact with corrosive aircraft oils and fuels at elevated temperatures, high filtering efficiency and simple field maintenance make this a superior filter.

Consisting of a "stack" of discs molded of KEL-F polymer, the porous plastic withstands pressure surges and thermal cycling without rupturing. Corrosives such as fuming nitric acid, hydrogen peroxide and hydraulic and lubricating oils are handled by the chemically-inert porous plastic. Throughput is increased simply by adding on more disc combinations.

The unique filters are manufactured by Aircraft Porous Media, Inc., Glen Cove, N. Y., and employ discs molded of KEL-F polymer Grade 300 by the Porous Plastic Filter Company, also of Glen Cove, N. Y.

*For further information ask for Application Report C-118*



## Molders & Fabricators of the Month

*Leading molders, extruders and fabricators specialize in the production of materials and parts made of "Kel-F" . . . each month this column will spotlight several of these companies with their principal services and products.*

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Compression & transfer molding
Injection molding

**Cortland Industries, Inc.**
Chicago, Ill.
Sealing of film
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**General Plastics Corporation**
Paterson, N. J.
Dispersion Coating

**United States Gasket Company**
Camden, N. J.
Extrusion
Forming & machining
Injection, compression & transfer molding
Rod, tube and sheet; tube sockets
Gaskets, gauge glasses & tower packing

**The William Brand and Company, Inc.**
Willimantic, Conn.
Insulated wire

## Recent Significant KEL-F Polymer Developments . . .

**Pyrex-to-steel** seal is effected in a new centrifugal pump with a resilient O ring of KEL-F plastic. Damage to the glass observation plate, leaks at high pressures have been eliminated.

**Electronic tubes** used at high altitudes are now hermetically sealed in new sockets made of fluorocarbon plastic. Consistent hermetic seal over a wide temperature range, low "arc-over" and shock damage are major features.

**Conductivity cell-valve** units for testing potable water use KEL-F polymer as a structural and electrical insulating member. Immersed continuously in water at temperatures up to 250°F, machined insulator maintains critical electrode gap.

**Pump vanes** of molded glass-filled polymer have been found to have the necessary strength as well as complete chemical inertness to stand up under hot, extremely corrosive chemicals in a new transfer pump.

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*Revised "BUYERS GUIDE" listing KEL-F polymer products, molders and fabricators.*

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geneous and smooth. With both modified and unmodified P.V.C., hot gas welding is the fabrication method offering the widest range of applications. An automatic welding machine recently developed and tested operates at the rate of over 30 in./min., compared to 10 to 12 in. by hand welding methods. Both transfer molded and injection molded pipe fittings are now available.

• • •

At a forum-type program on refrigeration and air conditioning applications of plastics, three papers were delivered by authorities in this field, followed by a panel discussion in which the speakers were joined by four representatives of the plastics industry, including Robert F. Hrudka, Chicago Molded Products Corp.; Frank Deli, Amos Molded Plastics Div.; Desmond Marcy, Cleveland Plastics, Inc., and Arthur N. Williams, Plastics Div., General American Transportation Corp.

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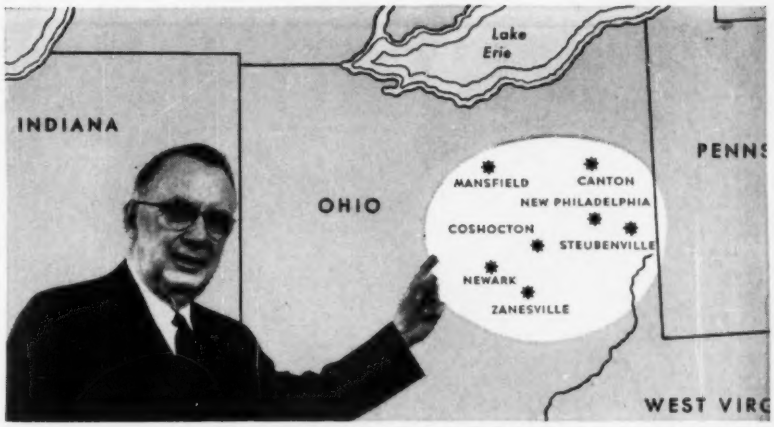
In a talk on **"Refrigeration and Air Conditioning Applications of Plastics,"** J. R. Hertzler, York Corp., stated that in 1953 manufacturers shipped approximately 1,075,000 room air conditioners, an increase of 150% over the previous year. Shipments in 1954 may reach 1,500,000 units. With more air conditioners exposed to public view, the plastics manufacturer has an increased opportunity to become a supplier to the air conditioning industry.

• • •

**"Domestic Refrigeration Applications of Plastics"** was the topic of R. E. Wallenbrock, Refrigeration Div., International Harvester Co. Low cost, light weight, attractive colors, complex shapes, and heat barrier characteristics were among the points cited as making plastics desirable for refrigerators, freezers, and air conditioners. International Harvester, he said, uses plastics in approximately the same manner as steel as applied to parts, selecting the proper type material to fit the application after consideration of all pertinent factors.

• • •

E. T. Morton, Midwest Mfg. Co. (Admiral), speaking on **"Potentialities of Plastics for Refrigerator Linings and Large-Area Parts,"** declared that the all-plastics liner is likely to be the next large part de-


H. Horton Hampton, *Vice President*, Industrial Development, Nickel Plate Road.

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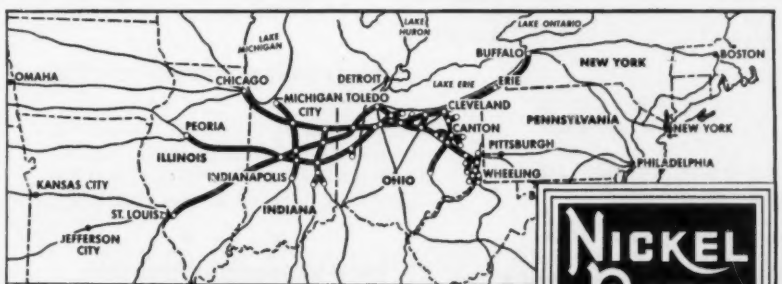
**Water**—An assured water supply comes from the Muskingum River, its watershed and tributaries, covering 8,038 square miles and controlled by 14 dams and 10 lakes.



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veloped. He urged closer cooperation between molders and customers in working out problems relating to new plastics applications. At Admiral, he said, function, cost, and estimated consumer acceptance are the three criteria used in judging the suitability of a plastic part. Some design based on formed sheet may prove the answer to the plastic liner; possibly a combination of molded top and bottom sections with formed sheet between.

• • •

Following Mr. Morton's talk, a lengthy discussion period was held in which molders, manufacturers, and material suppliers exchanged points of view on such topics as formed sheet *vs.* injection molded parts, the degree of cooperation which should be maintained between the molder and his customers, and the need for additional information on plastics properties as they relate to usage in refrigerators, freezers, and air-conditioning equipment. One point on which a degree of agreement was evident was that both formed sheet and injection molded components will continue to have a place in this field, depending upon such factors as the complexity of the part, tooling time required, length of the run, etc.

• • •

The concluding Conference session was devoted to plastics applications in automobiles and consisted of a forum-type program.

J. K. Totten, Plastics Operations, Ford Motor Co., speaking on **"Automotive Plastics Applications,"** outlined recent developments in applying plastics to automobiles, including structural, functional, and semi-functional as well as decorative parts. He also suggested that while many of these applications have now reached a relatively stable point, the increased use of plastics in interior trim offers a fruitful field for investigation, particularly in view of the fact that car owners are now demanding a car whose interior can be cleaned as easily as the outside.

• • •

Robert H. Voss, Warren Plastics & Engineering, Inc., discussed **"Cast Dies."** This company has built some of the largest phenolic dies used in the automotive field, having entered this type of work making aircraft dies to meet metal shortages. Mr. Voss predicted that a combination

of steel and plastic dies may expedite many new products at low tooling cost. Where sharp radii must be maintained, it is the practice to include a metal insert in the die. With plastic dies, the speaker pointed out, it is a simple matter to repour a new wear surface on the tools when necessary. Satisfactory runs totaling as high as 60 to 70,000 pieces have been made with the phenolic dies, Mr. Voss stated.

• • •

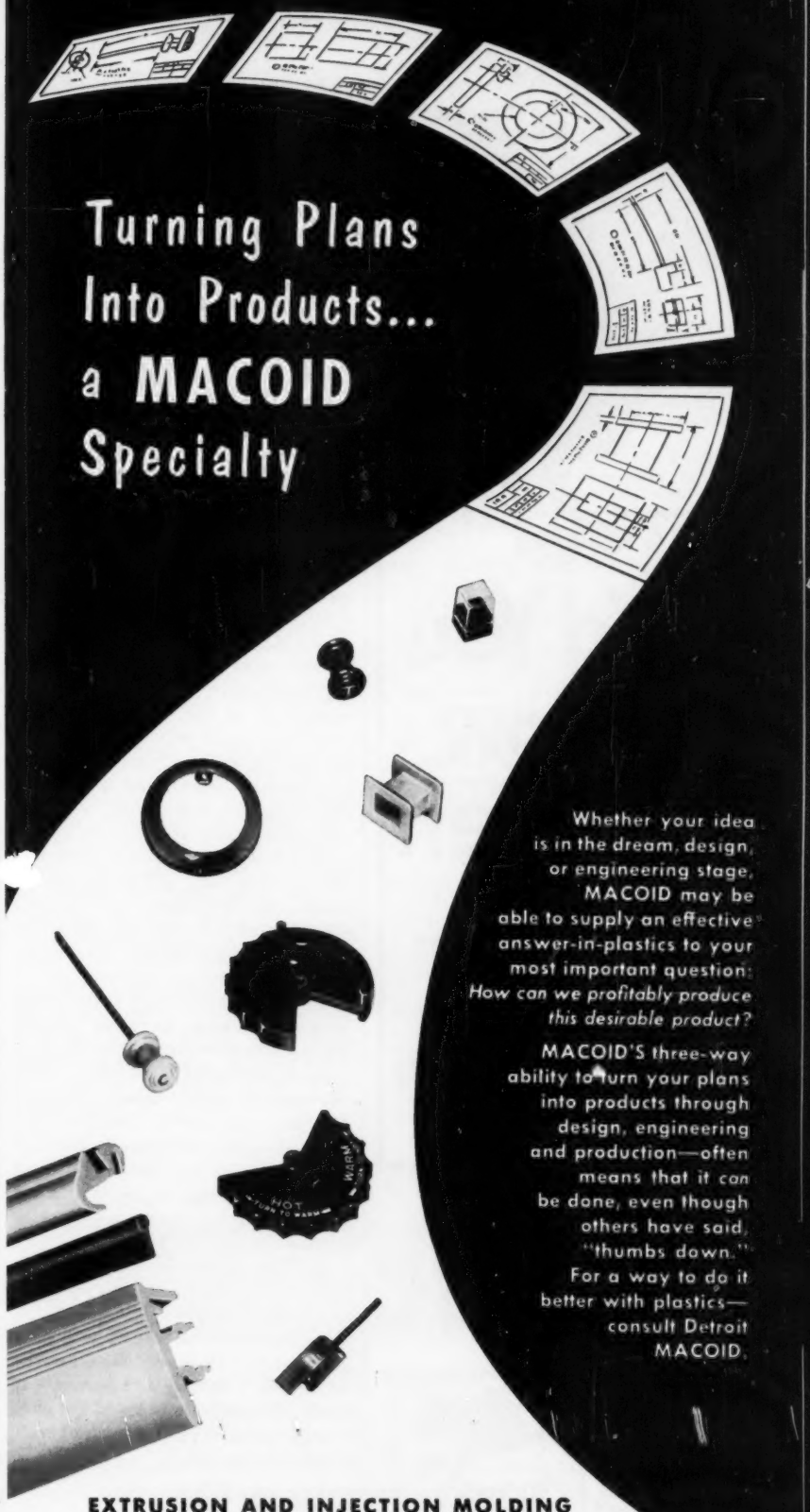
Fred Lyijynen, Automotive Body Div., Chrysler Corp., discussed **"Reinforced Plastics Tooling."** Although Chrysler's first work on plastics draw dies in the Body Div. was with phenolic, the decision was later made to switch to polyester-glass. All the Chrysler body dies are made with glass cloth on the face, backed with 2-in. chopped fiber for the core. Glass content of a finished die is approximately 50% by weight. The company is continuing its experimental work on plastic tooling with many new materials, some of which look very promising.

• • •

**"Epoxy Plastic Dies, Die Models, Checking Fixtures and Tooling"** were covered in a slide-illustrated talk by George M. Rice, Ren-ite Plastics, Inc. The fact that epoxy resins can be easily cast to accurate dimensions in relatively inexpensive molds, said Mr. Rice, makes plastics dies ideal for many purposes and most of the early skepticism surrounding them has now disappeared. Checking fixtures, with an accuracy of ±0.002 in., are 70% lighter in weight than metal fixtures, and much easier to handle. Spotting racks may be made in a few days. Dies which might require four to eight months to construct of steel, may be made in a few weeks with epoxy resins. Today the uses of these dies are multiplying rapidly and the field will get larger as better materials and techniques are developed.

• • •

In **"The Corvette Plastic Body,"** John G. Coffin, Chevrolet Div., General Motors Corp., traced the engineering development, molding, and assembly of the Corvette glass-polyester body, now in volume production. A fully assembled Corvette, as well as a set of all the reinforced plastic parts entering into its construction, were on hand for inspection by those attending.—END



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## It Adds Up

(*From page* 110)

bled one by one, the springs and plungers being inserted progressively, and the 45 pieces required being stacked to form the complete sensing unit. The molded pieces are so designed that the bottom side of one forms the top of the next, a 46th identical piece closing the 45th and last segment. With conventional machining methods of fabrication, cost of this assembly would be prohibitive and maintenance of accuracy next to impossible.

### Typewriter Applications

Figure 4 illustrates a plate model of a typical Remington electric typewriter power action. The problem in this case was the design of a cam-actuated power arm for each type bar to transmit power from a drive roll common to all keys.

As part of the original material studies, a metal cam was evaluated, but subsequently discarded because of expensive fabrication and excessive wear on the power roll. The materials finally selected, as shown in Fig. 4, were injection-molded nylon for the cam and a compound based on butadiene acrylonitrile modified with a phenolic resin for the power roll covering.

Although natural nylon was originally used for the cam, it has since been abandoned in favor of the white pigmented type, which has improved dimensional stability with the same or better bearing life. Both the cam and power roll covering have adequate resistance to oils and cleaning fluids commonly used on office equipment. In service these materials have proved exceptionally durable.

Another example of Remington Rand's use of plastics materials is the case (Fig. 5) for a new printing calculator. The material used is general-purpose phenolic. Because the calculator, although compact, is heavy, the wall thickness of the case is held to a minimum consistent with adequate strength.

### Electric Shavers

The entire line of Remington Electric Shavers also makes extensive use of plastics. The model shown in Fig. 6 has a body molded

(*To page* 216)


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**HYDRAULIC PRESSES.** Folder gives information on Elmes hydraulic presses for reinforced plastics molding. Lists specifications for five different presses. American Steel Foundries, Elmes Engineering Division. (H-402)

**LUBRICATING VINYL WITH POLYETHYLENE.** Bulletin explains use of polyethylene as a lubricant to increase the workability of polyvinyl chloride in the manufacture of films and sheets. Semet-Solvay, Petrochemical Div., Allied Chemical & Dye Corp. (H-403)

**ELECTRIC HEAT FOR REINFORCED PLASTICS.** Technical bulletin on the uses of electric heat in reinforced plastics processing operations with specific reference to curing of insulating board, styrene latex, preimpregnated materials and laminated stock. Edwin L. Wiegand Co. (H-404)

**CUTTING MILLS.** Description of cutting mills for reducing thermoplastic materials to granules suitable for extrusion and injection molding. Lists four machines with capacities from 35 to 400 pounds per hour. Condux-Werk. (H-405)

**HEATING AND COOLING CALENDERS AND PRESSES.** Reprint discusses the latest developments in the heating and cooling of plastics calenders and presses by means of high temperature water. Shows the advantages of this system over steam. American Hydrotherm Corp. (H-406)

**INDUSTRIAL PLASTICS EQUIPMENT.** Brochure illustrates and details 17 machines for use in plastics production. Included are mixers, sheeting mills, presses, both compression and transfer, and calenders. Lists individual specifications and applications. Stewart Bolling and Co. (H-407)

**PLASTICS SCRAP GRINDER.** Folder on the profitable grinding of plastics sprues, gates, warmup shots, and rejects into homogeneous granules for uniform mold flow using the American Rotary Knife Chopper. American Pulverizer Co. (H-408)

**AUTOMATIC COMPRESSION MOLDING MACHINES.** Bulletin on Baker fully automatic compression molding machines for high speed molding of small and medium size parts from phenolic, alkyd, urea, "Teflon," and other plastics materials. Baker Brothers, Inc. (H-409)

**NEW ROTARY MOLDING PRESS.** Folder provides valuable information on a completely automatic rotary molding press designed for use with any standard thermosetting material. Gives information on molds, temperature control, the machine's operation and specifications. Cropp Engineering Division, Warren Plastics Corp. (H-410)

**UNIVERSAL TESTING MACHINE.** Data on the Baldwin-Emery SR-4 universal testing machine of 50,000 lbs. capacity, for testing specimens or parts in tension, compression, flexure, torsion, alternating load, creep, stress relaxation and shock. Baldwin-Lima-Hamilton Corp. (H-411)

**INJECTION MACHINES.** Brochure contains details and specifications of vertical and horizontal injection molding machines, up to 36 ounce capacity, manufactured by Gebr. Battenfeld. (H-412)

**NEW FLUOROTHENE RESINS.** Comprehensive handbook contains technical data on properties, forms and fabrication of these new heat-resistant resins. Sixteen graphs and tables describe their high-softening temperature, resistance to burning, chemical inertness, electrical characteristics. Bakelite Co. (H-413)

**RESEARCH ACTIVITIES.** Booklet summarizes the research activities of Godfrey L. Cabot, Inc., in connection with the development and use of finely divided powders and pigments for plastics. Godfrey L. Cabot, Inc. (H-414)

**TESTING INSTRUMENTS.** Testing instruments for determining weight, bulk or thickness and bursting strength of plastics, metal, fabric, paper, rubber, foil, glass, etc., are described and illustrated in a pamphlet issued by E. J. Cady & Co. (H-415)

**HIGH-IMPACT POLYSTYRENE SHEET.** Bulletin describes strength, versatility and surface finish of "Gilco" high-impact polystyrene sheet. Explains the benefits of using the "Gilco" sheet in relation to lowered diecosts, greater printability, lower tolerances and greater depth of draw. The Gilman Brothers Co. (H-416)

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**RIGID PLASTICS PIPE.** Leaflet lists the advantages and standard dimensions for the rigid thermoplastic pipe manufactured in regular and extra-heavy weight by Carlon Products Corp. (H-418)

**RIGID POLYESTER RESINS.** Technical data on "Glykon-R100" resins. Tabulates properties of uncured and cured "Glykon," "Glykon" reinforced with glass cloth, and various blends of "Glykon-R100" and F800. Gives also, data on gel, peak exotherm and curing times with various catalysts and promoters. General Tire and Rubber Co. (H-419)

**DRY THERMOPLASTICS COLORANTS.** Chips showing six different color pearl effects and informative data on dry colorants for use with hi-impact styrene, polyethylene and with thermoplastics. Price list included. Plastics Molders Supply Co., Inc. (H-420)

**STYRENE.** Booklet gives information on the manufacture of "Styron" polystyrene, explains the various grades available and tells how polystyrene is employed in the molding of household appliances and accessories. The Dow Chemical Co. (H-421)

**CELLULOSE ACETATE SHEETS AND FILM.** Booklet gives full details on the properties and applications of cellulose acetate sheet. Also lists, in tabular form, the chemical resistance and electrical properties of Utilex cellulose acetate. Utilex, Ltd. (H-422)

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**THERMOMETERS AND GAGES.** Information covers recording and indicating thermometers, recording pressure and vacuum gages, and transformer thermometers for measuring the temperatures of gases, liquids, and solids. Price list included. The Electric Auto-Lite Co. **(H-424)**

**PLASTICIZERS.** Catalog contains detailed information on the Monsanto line of plasticizers. Gives complete data on the uses, properties, specifications and numerous applications of the various plasticizers. Monsanto Chemical Co. **(H-425)**

**CHOPPED GLASS STRAND.** Data sheet on Ferro chopped strand, used primarily for making preforms for reinforced plastics molding. Ferro Corp. **(H-426)**

**SPRAY PAINTING MASKS AND EQUIPMENT.** Data on a process for making "pressure formed" masks for spray decoration of plastics products, on an automatic washer for spray painting masks, and on jigs for holding them. Finish Engineering Co., Inc. **(H-427)**

**HYDRAULIC PRESSES.** Folder describes five hydraulic presses designed and built for all types of compression and transfer molding. These presses can be manually or automatically controlled. Platens can be steam or electrically heated. Erie Engine & Mfg. Co. **(H-428)**

**FLUORINATED RESIN.** Technical data on "Exon 40 XR-61," a non-flammable fluorinated resin inert to inorganic chemicals, heat, and light, yet soluble in selected organic solvents. Can be spread, coated, dipped or brushed on plastics, textiles, etc., to make them resistant to various materials. Firestone Plastics Co. **(H-429)**

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**GLASTIC FOR ELECTRICAL INSULATION.** Booklet compares the electrical and mechanical properties of Glastic Grade "MM" Fiberglas-polyester reinforced laminated with NEMA Grade "C" phenolic laminates and similar materials. The Glastic Corp. **(H-432)**

**VALVES FOR INFLATABLES.** Booklet describes 22 different clamp-on, seal-on and insertion type valves for use with inflatable plastics products. Includes mouth and pump operated types. Halkey-Roberts Corp. **(H-433)**

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**LEAD SCREW TAPPING ATTACHMENT.** Folder contains data on nine "Auto-taps" which fit on round column drill presses ranging in size from 14" to 20", and which tap precision threads in thermosetting and thermoplastic moldings. Price list included. Automatic Methods, Inc. **(H-436)**

**SYNTHETIC QUICK-DRYING LACQUER.** Technical data sheet gives information on "Rez-N-Lac," a synthetic quick-drying lacquer, formulated for coating and decorating polystyrene. Schwartz Chemical Co. **(H-437)**

**MIXING UNIT FOR FIBER DRUMS.** Data sheet on the Morse "200-B" portable rotator for mixing and blending the contents of various size fiber drums right at the press at speeds from 10 to 30 rpm. Morse Mfg. Co. **(H-438)**

**"PLIO-TUF" COLOR PELLETS.** Booklet discusses "Plio-Tuf" high styrene copolymer color pellets, what they are, their properties and uses in relation to injection molding and extruding. Lists six case histories where "Plio-Tuf" pellets were used. The Goodyear Tire & Rubber Co. **(H-439)**

**NON-ELECTRIC GRATE MAGNET.** Bulletin details the features of the Eriez permanent non-electric Model P Grate Magnet, designed specially for the detection of tramp iron in odd shaped, oval, or round cornered hoppers. Eriez Manufacturing Co. **(H-440)**

**INJECTION MOLDING MACHINES.** Folder describes the basic characteristics and molding capabilities of "Peco" high-speed direct hydraulic clamp action injection machines, Model 20m Series which are rated for two or three ounce capacity in polystyrene. Specifications included. The Projectile and Engineering Co., Ltd. **(H-441)**

**MOLDING PLANT FACILITIES.** Illustrations and a description of the design, moldmaking and injection molding facilities available to manufacturers at Quinn-Berry Corp. **(H-442)**

**AUTOMATIC CENTERLESS GRINDING MACHINE.** Technical data on centerless grinder used in forming beads, balls, and other small shapes. Firm also makes available custom grinding service. Engineering Laboratories, Inc. **(H-443)**

**LAMINATED PLASTICS.** Booklet on the manufacture, grades, properties, fabrication and use of industrial and decorative laminated plastics sheets, tubes, rods, and special shapes. Data on performance of plastics bearings. Joseph P. Ryerson and Son, Inc. **(H-444)**

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of tinted melamine formaldehyde. The hair-pocket and head-guard (not shown in the illustration) are injection molded of cellulose acetate. For this application, the elasticity of acetate is used to advantage. Both pieces snap into place and although held firmly in position by projections molded into the unit for this purpose, they can still be easily slipped off by the user. The coloring of the pieces also presents a distinct advantage in sales appeal.

A plate of punched phenolic laminate is used for the armature-shaft end bearing. Natural nylon is used for the breaker-point cam pads riding on the elliptical contour of the shaft end; natural nylon cam pads are also used for the rocker arm driven by an eccentric on the other end of the shaft.

These nylon parts, which are forced apart and then allowed to spring back into position by the action of the shaft, are claimed to outwear earlier experimental metal-to-metal assemblies by a factor of roughly 4 to 1 at the high r.p.m. involved; also, because they are injection molded and are readied for assembly by simply cleaning off flash, they cost less than the metal-to-metal assemblies in approximately a reverse ratio.

The out-of-the-ordinary applications sketched very briefly here can be regarded as achievements in design and engineering which, without the use of molded plastics, would have been immeasurably more difficult to attain.



**Thomas A. Sharp, the author of the accompanying article, "It Adds Up to Plastics," is a chemical engineer (University of North Carolina '37) with long and varied experience in plastics. From the time of his graduation until 1942, he was a chemist in the Fabrics & Finishes Department of Du Pont. He then joined Andover-Kent Aviation Corp., New Brunswick, N. J., working in the field of low-pressure lamination. Since 1946 he has been with Remington Rand's Laboratory of Advanced Research, his field being the properties and uses of plastics and other materials used in the company's products.**





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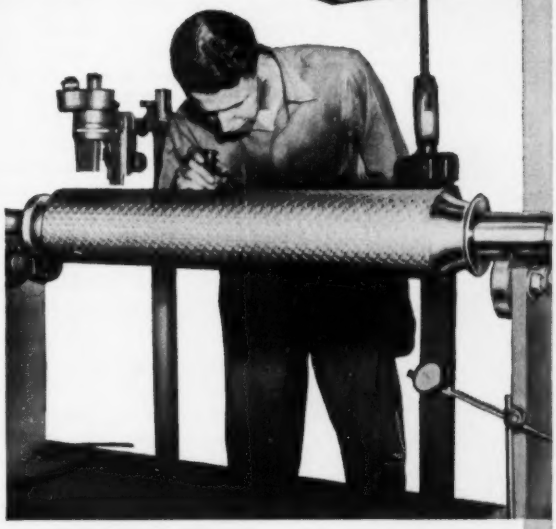
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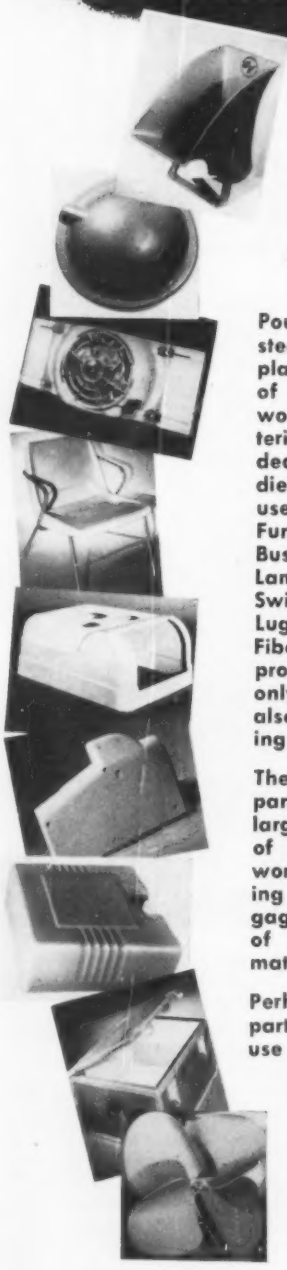
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## Physiological

(*From page* 141)

were exposed for a period of 30 min. of each 24 hr. at the 10 p.p.m. concentration level, the first deaths occurred after 10 days of this treatment and the last death was 24 days from the start of the exposure.

A final series of studies made at a halide concentration of 1 p.p.m. for a period of 28 days with a daily exposure of 1 hr. throughout showed no noticeable effects. The same mice exposed continuously to the same halide concentration for an additional 2 wk. also showed no effects and were normal in all respects.

It appeared, therefore, that the fluorocarbon vapors studied have a threshold value for destructive respiratory activity on mice between 1 p.p.m. and 10 p.p.m. Continued exposure to concentrations greater than 10 to 100 p.p.m. result in death. Daily exposures appeared to have a cumulative effect particularly in the region of 10 p.p.m. halide concentration.

The mice exposed to these conditions exhibited the effects normally ascribed to irritant gases. Vigorous brushing of the face and eyes with the fore paws, gasping for breath and searching for air, ruffing of the fur, and swelling of the nose and mouth all occurred. In addition, a bluish discoloration of the bare portions of the skin took place similar to that characteristic of cyanosis.

Autopsies showed inflammation and destruction of the tissues, edema of the lungs, and enlargement of the heart.

All of the above are symptoms of the effects of the corrosive and irritant physiological gases. It was obvious that the vapors generated upon heating these fluorocarbon polymers must be classified as highly toxic and proper precautions must be taken to safeguard personnel handling these materials at processing temperatures.

### Dietary Experiments

To complete the study, a series of dietary observations were made wherein the fluorocarbon polymers were added to a standard diet of mice.

The control group had the same diet with the exception of the added fluorocarbons. While the work was not sufficiently complete to warrant broad conclusions, it was apparent that although the mice on the supplemented fluorocarbon diet appeared to grow normally, at the end of a 6-mo. period those fed Polymers A and B developed spotty loss of fur, skin lesions, and a 50% loss in weight. Those fed with Polymer C appeared normal in all respects.

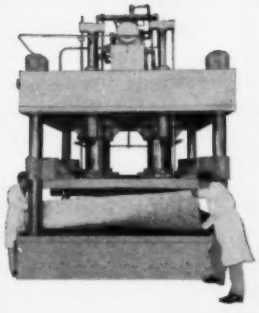
Ordinarily, the alimentary tract is extremely resistant to foreign, indigestible materials. The reported chemical and physical characteristics of these materials would lead one to believe that they should be inert when ingested. The effects observed over a long period of time are quite marked and while those that were fed Polymer C showed only a weight increase, this fact alone must be considered as a danger sign. A need for caution during processing of the materials is indicated in those cases where the animals became emaciated and showed skin lesions and dermatitis.

Grateful acknowledgement is made to The Connecticut Hard Rubber Co., which provided the funds for carrying out the work.—END

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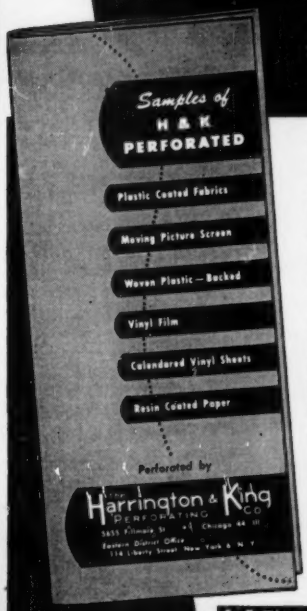
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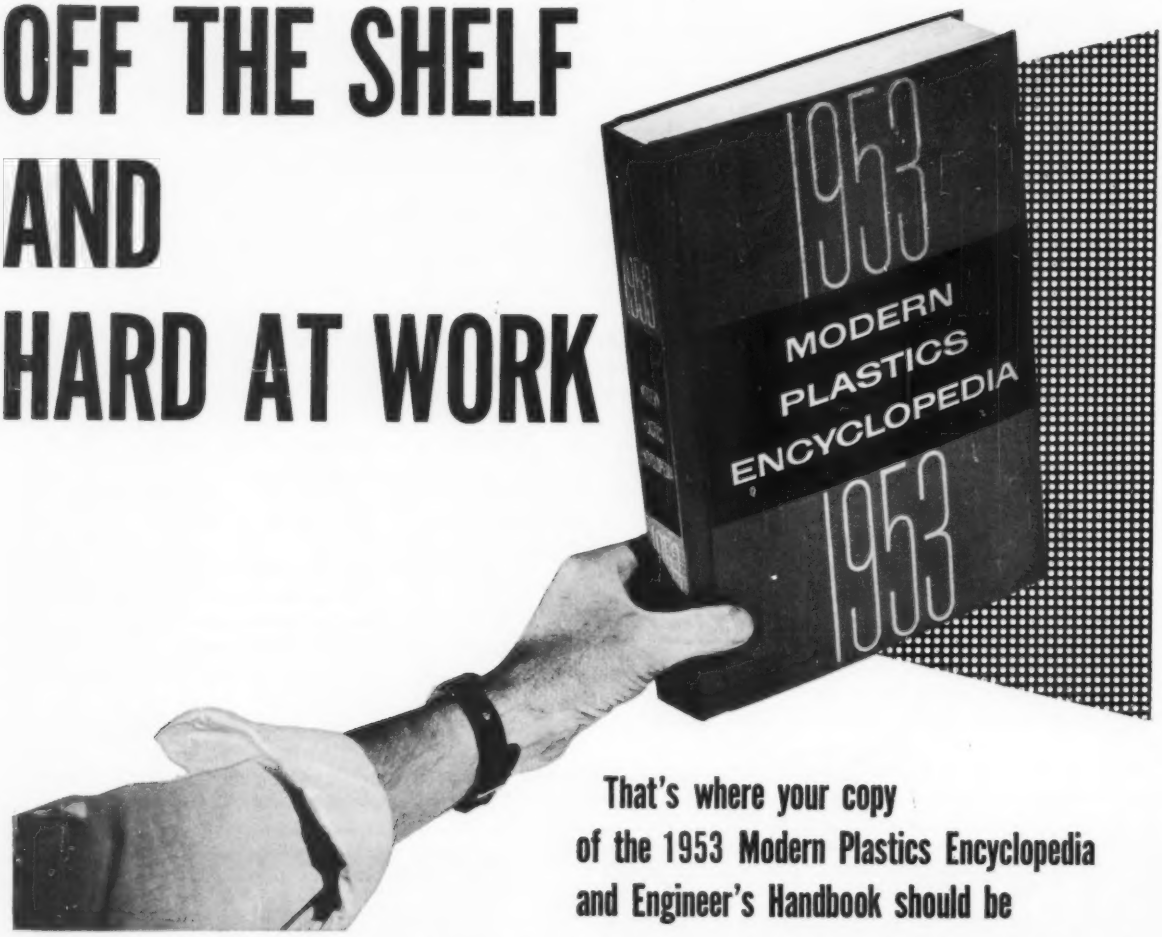
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## Research

(*From page* 134)

plastics industry occupies compared to the other industries.

Let us now consider the position of these other industries with respect to research institutes. The Textile Research Institute, now located at Princeton, N.J., was organized in 1930. The Institute of Textile Technology, Charlottesville, Va., was founded in 1944. These institutes have research as their primary function with educational activity as a supplemental function. These research institutes are supported mainly by funds from industrial firms, either in the form of memberships and contributions or in the financial support provided for specific research projects by the individual firms.

The Institute of Paper Chemistry, affiliated with Lawrence College at Appleton, Wisconsin, was organized in 1929 through the efforts of a group of Wisconsin pulp and paper mill executives and the officials of Lawrence College. At present pulp and paper mills in 34 states support the Institute. Its objectives are as follows: 1) the training of technical men, graduates of recognized colleges and universities, through a period of graduate study, to assume responsible positions in the industry; 2) the organization of a research library for the use of the Institute and the industry as a whole; and 3) the establishment of a research center, where the latest scientific equipment and knowledge could be accumulated and made available to the industry and where researches could be carried on in both fundamental and applied problems.

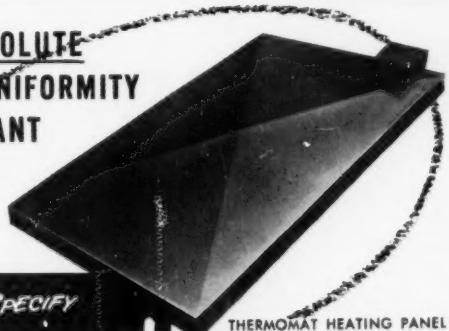
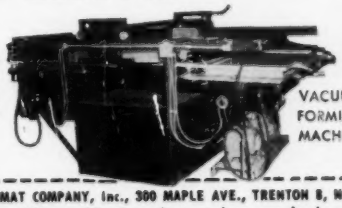
The Tanners Council of America organized the Tanners Council Research Laboratory at the University of Cincinnati in 1924. This laboratory has conducted fundamental and applied research on leather and tanning processes since that date. It is supported by tanners and other firms concerned with leather products.

### European Efforts

In this connection the following news item from Germany, which is the second largest plastics producer in the western world, may be of interest:

"In the research field, the foundation of the *Kunststoffe Forschungsgesellschaft* (Plastics Research Society) and the decision to establish the *Deutsches Kunststoffinstitut* (German Plastics Institute) under the sponsorship of this organization are considered to be of the greatest long-range importance. New stimulus in research in plastics is expected to come from the Plastics Research Society established by the plastics industry trade associations in November 1953 to promote scientific research and its practical application in the plastics field and from the German Plastics Institute. The Institute will work in conjunction with the *Institut für Technische Physik* at the *Technische Hochschule*, Darmstadt, and will supplement industrial research, train young scientists in the specialized field of plastics and maintain a documentation center for the industry. The costs, which will be shared equally by the government and by the plastics industry, include an amount of DM 1,300,000 (approximately $310,000) for construction

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High impact styrene sheets are made on a continuous-production basis. These sheets are of better quality than any ever before extruded in volume . . . finer textured, more uniform, in any color. Available in gages from .010" to .200" and widths to 42". Also available with highly glazed surface. Whatever your needs for styrene sheets, get them from Auburn. Producers of plastic parts since 1876.
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They have proved ideal for preheating plastic sheets and drying and curing fabrics and coatings.
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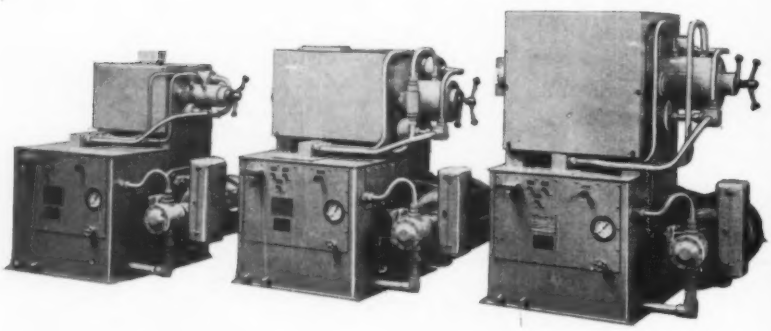
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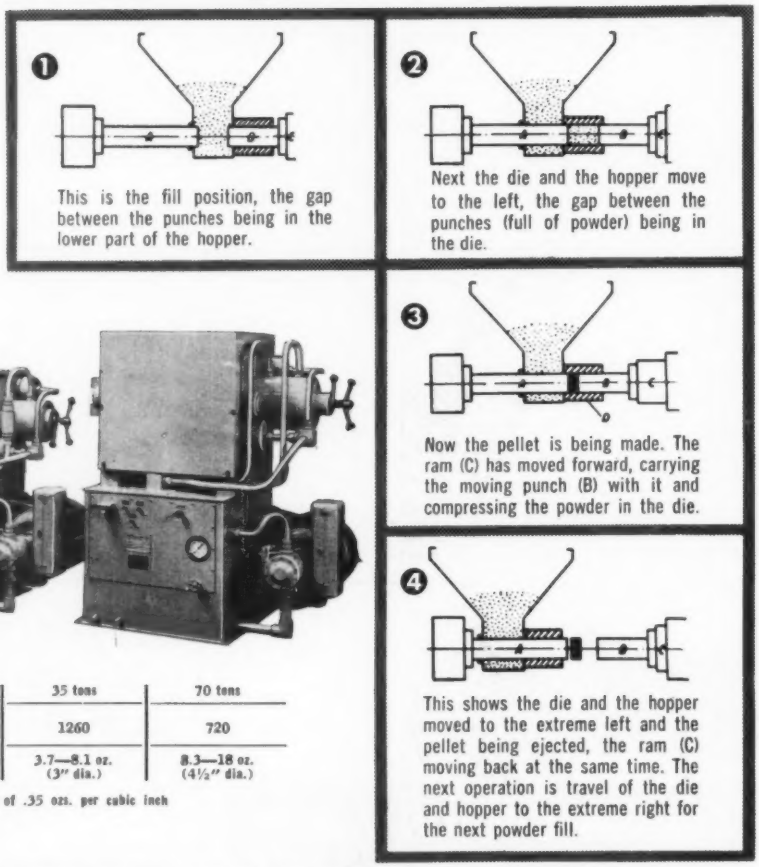
# BIPEL Horizontal-Hydraulic Pelleters

## for modern high-speed production



| maximum pressure | 12 tons | 35 tons | 70 tons |
|---|---|---|---|
| maximum strokes per hour | 2280 | 1260 | 720 |
| typical pellet weight* | .2—1.2 oz. (1½" dia.) | 3.7—8.1 oz. (3" dia.) | 8.3—18 oz. (4½" dia.) |

based on average powder density of .35 ozs. per cubic inch




THESE FAST, single stroke preformers combine all the advantages of hydraulic operation with the highest production speeds. Their economical, quiet, relatively dust-free operation out-modes the noise and mess of conventional preformers.

A unique BIPEL feature is the use of the main ram for compressing the powder; fill and ejecting depend on the rapid side-to-side motion of the die and hopper. This action is a vast improvement over blow compression used by mechanical preformers. A steady squeeze can be applied for any length of time required to compact the powder. BIPEL preformers often handle powders considered unpelletable by conventional means since both "dwell" and pressure are easily adjusted to suit any material. Accurate pressure settings are completed in seconds.

The die rides completely free during the squeeze, which is the equivalent of applying pressure on both punches, thus producing uniform pellet density. No machine damage can occur as no moving parts ever enter between the punches . . . and the new BIPEL pelleters are easily cleaned in just a few minutes.

BIPEL Hydraulic Pelleters are completely self-contained with their own motors and pumps (shop air supply is used for the controls). Since pressure only builds up during squeeze and ejection, the motors idle most of the time. Power consumption is small and no more than routine maintenance is required.

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over a three-year period and operating costs totalling approximately DM 500,000 (approximately $120,000) annually when the institute is completed. It is anticipated that initial documentation work can begin within a year."

Considering the economic position of the plastics industry in 1950 relative to the textiles, paper, and leather industries and its anticipated phenomenal rate of growth during the next quarter century, now is certainly the time for the birth of a Plastics Institute in the United States to prepare for our future needs for men and facts in this field. This is, of course, a long-range project as compared with the short-term specific research projects which currently have SPI sponsorship at the University of Michigan and Battelle Institute. The Plastics Program now sponsored by the School of Engineering of Princeton University, the MCA research project at the Massachusetts Institute of Technology, the NEMA sponsored work at Johns Hopkins University, the Institute of Polymer Research at Brooklyn Polytechnic Institute, and programs at other Universities should be considered in any integrated industry effort.

## Research and Competition

Dr. E. K. Bolton, retired director of Du Pont's Chemical Dept., on the occasion of receiving the Willard Gibbs Medal recently said that fundamental research is the only way a company can maintain a competitive position amid rapid technological advances. Certainly a lot of research, both fundamental and applied, supported at a budget level with respect to sales income far higher than the general industrial average, has been responsible for the growth of the plastics industry from a 45 million dollar business in 1935 to its present level of approximately two billion dollars. This adds up to a more than forty-fold increase in the past 20 years. Put this way, it does not seem such a formidable proposition for the industry to reach the eight billion dollar mark by 1975. To attain this competitive position in the industrial economy, however, will require the continued support by the plastics industry of fundamental research, the key to future progress and achievements in plastics.—END




# THE PLASTISCOPE*

## NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. VAN BOSKIRK

### Undertones at Cleveland

PLASTICS expositions have been going through various stages of evolution since the first one that was held just after World War II. At that particular show, there were probably more processors' booths than any other classification. At the Sixth National Plastics Exposition, held at Cleveland in June 1954, the number of processor-exhibitors could be counted on one's fingers. The "show" has been taken over by equipment and materials suppliers. Indeed, so dominant were equipment displays that one observer remarked that there ought to be two shows—one for equipment and one for materials suppliers.

The number of steel company representatives in attendance was especially significant. Said one of them: "We aren't spying or looking for competition from plastics materials, but we've got to keep our eye on this big, new equipment market. It's a highly promising prospect for tons and tons of steel."

**Emphasis on Stock Items**—Exhibitors at the show placed most emphasis on stock items and those that have been introduced during the past two years. The practice of making a "big splurge" about heretofore unannounced new materials at shows and conventions seems to be on the way out. Probably most companies now prefer to make those "big splurges" at odd times during the year when there isn't so much competition for publicity.

However, the new ideas and obious traces of what's coming were all over the place; if not visible, they were at least audible wherever men gathered together to chew the fat or flex an elbow. There were no doubt scores of confereences to discuss secret developments about materials that are as yet too far away for evaluation.

There were many groups talking about possibilities for the smaller volume resins and the auxiliary materials that make plastics processing possible. But there were half a dozen or so dominant questions being discussed under the surface which were probably more exciting to more show attendants than the visible presentation of actual products for the plastics industry.

**Trends on the Way**—Some of these questions were: how to keep polystyrene and kindred materials in the forefront as a high-volume plastics product; how big is polyethylene consumption going to become and how soon; when will rigid vinyl assume its prospective position as a high volume-production plastic; are expanded or sponge plastics destined for a great future and, if so, how does one get into that branch of the business; is vacuum forming the next big step in mechanical handling of plastics; do recent mergers and amalgamations mean that the plastics industry is emerging from individual proprietorship? And then, of course, there was the usual hub-bub about the future for polyester-glass plastics. But the latter was not unusual —the hub-bub has been going on for years and volume is still disappointingly small. This reporter has taken an oath never to say again that "this is the year for polyester-glass"; comment will be reserved until he can say this *was* the year.

Space permits detailed discussion of only the first two questions in the above list.

**Tougher Polystyrene**—A striking example of what's going on in polystyrene and other resins with a styrene base was Dow's introduction of its new extra high-impact Styron 480, which the company states is 10 times tougher than general-purpose polystyrene and will sell for 41¢ a lb. in comparison to regular crystal at 31½¢; regular colored at 34½¢; high-impact Styron 475 at 34¢ for natural and 36¢ for colored; medium impact 777 at 35½¢ for colored.

Test strips molded of the new material will bend double without breaking; the molded surface is remarkably glossy; and the material retains the characteristic properties of other polystyrene formulations. The toughness has been achieved without sacrifice in heat distortion or surface finish.

Styron 480 is *not* a replacement for 475 but it is expected to broaden the market and to be considered for use wherever an injection molded thermoplastic requiring extreme toughness is desired and where no other polystyrene will meet the specifications. It can also be used for extrusion into shapes or sheet that can be stamped, embossed, and vacuum or pressure formed.

This new material is another step toward production of low-cost polystyrene-type resins that will not give rise to complaints of brittleness in finished products. Dow will give no information on the content of the formulation—doesn't even like the use of the term modified polystyrene; to the company it is simply extra high-impact polystyrene and different from anything else on the market.

**Styrene Based Resins**—The confusion existing over nomenclature in this field is unfortunate, but understandable. There are many resins based on styrene monomer, but Dow asserts that to call them modified styrene molding materials is inaccurate since styrene is a liquid and cannot be molded. Other producers classify these materials as modified polystyrene or rubber-modified styrene molding compounds.

Obviously, the polystyrene producers have their eyes on potential competition from low-cost molded polyethylene and the tough cellulosics which have edged back into the picture even though costing a little more. They also aim to squelch the criticism that polystyrene has limited applications because of brittleness by producing low-cost kindred resins which will meet that challenge. However, regular polystyrene is by no means being written off. Producers expect it to continue in large volume for years to come. There are now many applications where it is a perfect fit and it won't be dislodged

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Swedlon Laminate XIG-112, approved under MIL. Spec. A-17856 (Aer) Armor fragm. non-metallic, protects the pilot at the most vulnerable points of the cockpit—on the floor, as protection against flak—in the backrest, as protection from bullets—and as protection for the vital electronic controls.

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## SWEDLON—armor for modern "knights of the air"




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easily. Present production of styrene-type molding compounds is running between 25 and 30 million lb. a month, which is just about as high as it ever was, and the largest portion is still thought to be regular polystyrene.

**Styrene Copolymers**—On the outer fringe of these so-called high-impact polystyrenes are the styrene-butadiene and styrene-acrylonitrile copolymers. Some of them are modified with rubber. They are in a higher price classification, ranging from 45 to 65¢ and more for special formulations. The styrene-acrylonitrile copolymers are the oldest in this group. Bakelite announced an improved formulation of its C-11 during the exposition. It has better flowing characteristics than the former C-11 and, therefore, improved moldability and usefulness.

**Butadiene Moves In**—Butadiene has recently moved into the styrene field as a copolymerizing agent in a new way. It is a chemical that the plastics industry should watch more closely than ever, especially when and if the Government's butadiene plants become private property. There are lots of possibilities for its utilization in plastics. It has long been used as a copolymer in the so-called high styrene-butadiene resins used for rubber reinforcement in shoe soles and rubber floor tile, as well as in latices for paint, but there are now styrene-butadiene and acrylonitrile-butadiene molding formulations on the market.

Most of the styrene copolymers are notable for their tensile and flexural strength. But they are all higher in cost than high-impact or modified polystyrene. The styrene-butadiene molding and extrusion material is 52¢ a lb. and most of the others, except C-11, are higher. The latter has been reduced twice in the last year and now ranges from 45 to 50¢ a lb. in large quantity orders. Most observers say that cost is the principal factor in the limited volume use for these materials. It would be wise to keep an eye on this price structure even though no price reduction seems imminent.

And always in the background is the ever-increasing amount of sheeting being produced from styrene-based resins with its concomitant effect on molding and extrusion operations.

**Summation**—The polystyrene and kindred resins situation is seething with undetermined possibilities. Production will undoubtedly increase, but which particular resins will enjoy the most increase and in how much volume, is a question that no one can answer with assurance. Molders and extruders who fail to keep alert to every possibility are likely to find themselves trailing the pack.

**Polyethylene Producers**—Interest in polyethylene at the show largely centered in how soon the proposed new increments would come in and what would happen to price.

The following report is based on interviews with many responsible persons. It isn't guaranteed 100% accurate. By now everyone should know that speculation on when new polyethylene facilities are to come in is dangerous because of the manufacturing uncertainties involved. But because of manifest interest in the subject, we are printing here what is believed to be as reliable a summary as it is possible to obtain:

*Bakelite*: The 60-million lb. or more capacity plant at Texas City, Texas, came in late in 1953 and is now operating as expected. The new plant at Seadrift, Texas, of about the same capacity, is expected to come in as scheduled in the third quarter of 1954. The third plant in California is expected to come in during mid-1955. Company officials emphatically deny that any postponement is contemplated. Together with the first plant at Charleston, W. Va., the capacity of all four plants will be 250 million lb. or more a year.

*Du Pont*: Expanded facilities are right now almost ready for commercial production. The company has been making trial runs for several months. These new facilities have been under construction for two years. Total capacity of all Du Pont polyethylene operations will be in the 100-million lb. range.

*Tennessee-Eastman*: Production is likely to start by the end of 1954. The company will give no official sanction to prospective production date. Two certificates of necessity were issued to them by the Government—one for high- and one for low-molecular weight polyethylene. Capacity has been guessed at 20 or 25 million lb. a year.

*Monsanto*: Developmental quantities are expected in the last quarter of 1954; large-scale production of commercial grades is hoped for by early 1955. Capacity is listed at 60 million lb., with another plant planned for later.

*Spencer Chemical*: Commercial quantities should be reached by April or May of 1955, but the company hopes to come in before that. Capacity is listed at a little less than 50 million pounds.

*Dow Chemical*: Indications are that the company will be happy if it has polyethylene in commercial quantities by mid-1955. Officials are extremely careful in their statements on the subject. Dow may have a surprise up its sleeve—has been highly secretive about its research on the subject. Original capacity is guessed at about 25 million lb., but there is no official confirmation.

*National Petrochemicals*, Tuscola, Ill.: Expects to be in commercial production before mid-1955, with a capacity of about 25 million pounds. Sales may be through contractors as is the case with the company's other ethylene products produced at the Tuscola plant.

*Koppers*: Production is hoped for by mid-1955. Trade guesses are that that date won't be met because of late start. No capacity volume has been announced.

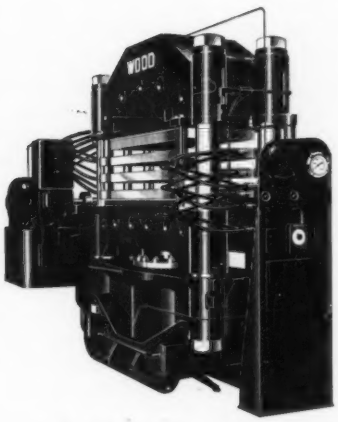
*Allied Chemical*: Makes no comment. Has for some time been making low-molecular weight polyethylene which is used in wax.

*Phillips Petroleum*: Makes no promises as to when commercial quantities will be produced by its new low-pressure process. Trade guesses that such time is somewhere around two years away. Supposedly a low-pressure process would lower production costs, but trade sources also think the product would be different from polyethylene now on the market—possibly



# *Would you trust the woolly bear?*

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more rigid. On the other hand, it has also been stated that laboratory samples of polyethylene made by Phillips have a tensile strength of 3700 p.s.i. compared to around 1800 for standard polyethylene and that it will withstand a 30° higher temperature, thus permitting sterilization. According to President Endacott of Phillips, Marlex 20, one of their new formulations, has been introduced for market evaluation as a modifying blend with regular polyethylene to produce greater resistance to heat and water vapor penetration. He also said that Marlex 50, the newer material, has remarkable strength, toughness, and flexibility.

Along this line, it is also known that a German firm claims they can and will make polyethylene without pressure within the next few years.

**Polyethylene Prices:** The price situation in polyethylene will always be a pet subject of conversation because Bakelite officials long ago implied that they expected to remain the biggest producer in the field and hoped that some day they could get the price down under 30 cents. But they didn't say when. Today the lowest price in quantity lots is 41 cents. When it will drop under 40¢ is a moot question. Supply is somewhat ahead of demand today but, nevertheless, more is being sold at this time than anyone expected six months ago.

Right after the plastics exhibition, Visking, a leading producer of film, announced a cut in film prices from 5 to 10¢ a lb.—most of it in the 5¢ category. That still leaves a difference of nearly 20¢ between resin and film prices: just before Korea, the difference was only 14 cents. Trade sources say that perhaps Visking aimed to stop price sniping by some of the smaller film producers but, by and large, the idea is conveyed that a very tough price situation is current in film markets and competition is going to be rough. There are already between 30 and 40 polyethylene film producers and they are all on the hunt for outlets. The potential market is much bigger than at present, but it takes time to develop.

The situation in polyethylene-coated paper is somewhat similar where there are at least 25 producers and some 35 or 40 machines installed for doing the job. Markets have been slower to develop than expected, with the result that producers fight hard to get what there is. This, too, is a big potential field but initiation into the market is likely to result in more discomfort for some producers than is hell-week for an initiate into a college fraternity.

## Color for Polyesters

DEVELOPMENT of pastes for use by molders or fabricators in coloring liquid polyester resins has been announced by Plastic Molders Supply Co., Inc., 74 South Ave., Fanwood, N.J. The color pastes may be used for all types of applications and with most combinations of resin, glass mat, glass cloth, and fillers.

The pigments used in these color pastes have already proved themselves in coloring plastics of various types for the past 10 to 15 years. The majority of the colors can be used for outdoor applications without fear of color fade-out.

## Junior Achievement

THE annual award of the Society of the Plastics Industry, Inc. to the Junior Achievement company producing the best plastics product of the year has been presented to Teen-Plastics Co., Springfield, Mass. The enterprising organization manufactured and sold molded plastic coasters under the sponsorship of Monsanto Chemical Co.

Teen-Plastics, composed of 15 Springfield high school students, was judged the best of 35 Junior Achievement companies competing in the finals of the contest held in New York City. The judges were: Harriet Raymond, Celanese Corp. of America; S. Jack Helsper, Mack Molding Co.; Charles B. Sanders, Dillon-Beck Mfg. Co.; and Langdon P. Williams, S.P.I.

Second place in the contest went to Erco Products Co. which produced foam plastic decorations, napkin holders, and salt and pepper shakers under the sponsorship of The Egry Register Co., Dayton, Ohio. The third prize was awarded to Plastic Novelties which manufactured foam plastic decorations under the sponsorship of Nash-Kelvinator Corp., Milwaukee, Wis.

## Reprocessed Polyethylene

REPROCESSED polyethylene made of top-quality, off-gage film is now available from George Woloch, Inc., 82 Beaver St., New York 5, N.Y. The material is reported to be approximately as free of contamination as virgin stock.

The reprocessed polyethylene may be obtained in pellet form, uniformly colored from batch to batch, for quantity orders on a regular basis. Clear and standard colors are available from stock; custom colors may be had on order.

The company also supplies other grades of polyethylene, reprocessed polystyrene, and surplus lots of virgin powders, and does custom reprocessing of all scrap plastics.

## Plasticizer Raw Material

COMMERCIAL quantities of para-tertiary-butylbenzoic acid are now being produced at Shell Chemical Corp.'s new plant at Martinez, Calif. The acid, a chemical intermediate, is made by blowing air through hot liquid p-tert-butyltoluene in the presence of a metallic catalyst.

Current principal outlet for the acid is in surface coating applications where it may be employed to upgrade vegetable oil. Potential uses for the material include the preparation of alcohol and glycol esters for plasticizing polyvinyl chloride, cellulose ethers, and esters.

## Dry Blend Vinyl

USE of dry blend vinyl resins seems to be growing steadily; at least, the number of companies producing it is on the increase. The Goodyear Tire & Rubber Co., Inc., the latest to put a dry blend on the market, is the fourth vinyl producer to enter the field.

Dry blend vinyl resins are sold primarily to vinyl processors who do not have a Banbury or a mill. In use, the dry blend is compounded with plasticizer and other needed components in a simple ribbon blender and then placed in the extruder or molding machine. Of course, there are



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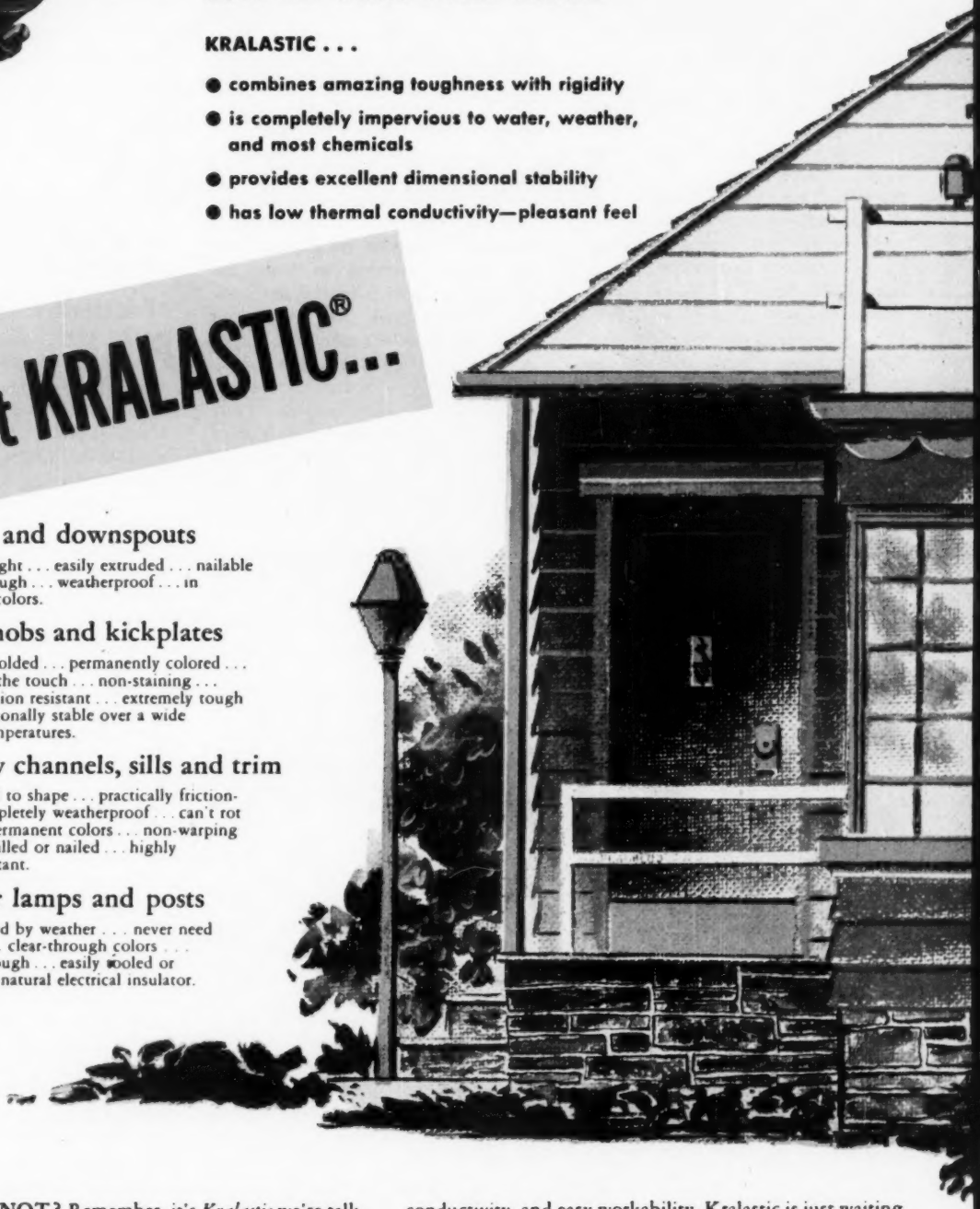
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limitations to its use, but for such things as certain types of wire coating, garden hose, clothes line, and gasketing, it can often be quite satisfactory.

The new Goodyear Pliovic DB80V is claimed to have improved heat stability and flow characteristics. The particles are dry, free-flowing, and exhibit an irregular surface. Their structure encourages absorption of the plasticizer. The similarity between the dry blend and other Pliovic resins allows the same compounding ingredients to be used with the new dry blending resin as are used with the general-purpose resin. In fact, the similarity is such that Pliovic DB80V can be substituted directly in any formulation based on Pliovic G80V. Best results are obtained in unloaded or lightly loaded compounds. Concentration of lubricants should be kept very low for best extrusion results.

## New Type Sponge

ISOCYANATE sponge will be in production in this country by October 1954, according to officials of American Collo Corp., a Div. of Collo Corp., now making the product in three European plants. The product has had wide acceptance in Germany for the past five years.

The American organization will be independently operated but affiliated closely with the parent company in Germany so that it can share in such matters as know-how, machine technique, and all new developments. The American company will operate under a license to make isocyanate sponge which has been granted by Mobay Chemical Co. The latter is a joint venture of Monsanto Chemical Co. and Farbenfabriken Bayer, A. G., Leverkusen, Germany, which will produce isocyanate in this country and license various companies that wish to make sponge by their patented process.

The American Collo plant will be under the direct supervision of vice president Rolph Moroni, who is also president of the Collo firm in Germany. He is a pioneer in the development of foamed isocyanate—probably more experienced in handling production operations for this material than any man in the world. This fact assumes particular importance because the raw material is so tricky. Each batch of raw material is likely to produce a different end product unless the processor knows how to control it. Temperature changes, moisture conditions, and the proper moment to foam the mixture are only a few of the variables encountered. And even after these problems are solved, according to Mr. Moroni, 50% waste is to be expected.

Other officers of American Collo Corp. are Otto Seligman, president; Dr. Joseph Winkler, chief chemist; Herman H. Fox, production manager; and Samuel Dansker, sales manager.

**Polyurethane**—So-called isocyanate foam is really a polyurethane. The latter resin is produced by combining a certain form of polyester with di-isocyanate and various other materials. The finished foam will retain its elasticity and tensile strength from −50 to 300° F.

The principal products of polyurethane sponge made in Germany are various types of sponges and brushes which will be described in a near future issue of MODERN PLASTICS. American Collo has developed a special line of foams for household use and technical products that will be specified by industry. An example is a sponge-like material to cushion shock in packages dropped by parachute. Another interesting possibility is a filter for cigarettes made from a special type of foam. A polyurethane filter will remove organic tars and nicotine but will take up no moisture as do cotton or cellulosic filters.

## Insulating Laminate

AVAILABILITY of a new high-pressure fibrous glass-polyester sheet stock for electrical insulating purposes has been announced by The Richardson Co., Melrose Park, Ill. The material, called Insurok XT-200, is primarily an insulating sheet with excellent structural properties that should find application on many types of electrical equipment.

Richardson states that Insurok XT-200 has excellent electrical properties, which are maintained at elevated temperatures, and high arc resistance. While it is considered a Class B insulation and can withstand higher temperatures than paper or canvas-base phenolic laminates, it is priced between canvas- or linen-base laminates and paper-base laminates.

The material is available in sheets 34 by 34 in. in thicknesses of 1/16, 1/8, and 1/4 inch. Additional thicknesses will be offered at a later date.

## Polyethylene Bag Plant Sold

PURCHASE of Herb-Shelly, Inc., Farmington, Minn., producer of polyethylene bags and liners, has been announced by Charles A. Ward, president of Brown & Bigelow, St. Paul, Minn.

Manufacturing operations and personnel of Herb-Shelly will be retained in their entirety in Farmington. Gilmore T. Schjeldahl, now president of the company, will remain as president of the subsidiary.

## Cellothene

EXTRUSION-LAMINATED Cellothene, a new flexible, transparent film laminate of polyethylene and cellophane recommended for packaging hundreds of items from almonds to zwieback, has been developed by Cheslam Corp., Div. of Chester Packaging Products Corp., 284 Nepperhan Ave., Yonkers, N. Y.

The material uses no binders, adhesives, or connecting agents. It combines the properties of polyethylene and cellophane of the Sylvania MSBO type to produce a heat sealable, moistureproof, tough, and leakproof film. Cellothene is laminated in varying thicknesses, ranging from 0.0005- to 0.006-in. polyethylene combined with 300- or 450-weight cellophane, permitting full protection of specific products with greatest economy.

The company claims that the material, successfully tested for protective packaging of a variety of products, will not pucker or shrink, has high fold endurance, tear resistance, and excellent tensile, burst, and tear strength.

Cheslam asserts that the uncoated surface of Sylvania's MSBO type cellophane is excellent for ink ad-

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hesion and can be printed by all the usual processes on standard equipment before the polyethylene coating, which locks the printing in, is applied.

Simultaneously with the development of Cellothene has come the new high-speed Model V-1 Roto Pouch machine, designed to make pouch-type containers from heat sealing coated or laminated materials such as Cellothene. Developed by Roto Bag-Holweg Div. of Conapak Machine Co., 120 E. 13th St., New York, N. Y., the machine is reported to achieve very high speed on a single pouch operation or even higher on a twin pouch operation. The twin pouch, perforated down the center fold, is adaptable for multiple sale of products such as women's hosiery, encouraging sale of two pairs instead of only one. The pouches can be torn apart if only one pair is desired.

## Vinyl Inks

NEW vinyl inks in concentrated form for gravure and silkscreen printers of rigid vinyl plastics, are reported to offer exceptional resistance to abrasion and block. The series of inks is available from Claremont Pigment Dispersion Corp., 110 Wallabout St., Brooklyn 11, N.Y.

The company's technicians claim that prints made with these inks and topped with a clear vinyl liquid also produced by the company have exceeded 55 cycles before top breakthrough and 600 cycles before complete break-through on a Tabor Abraser. No blocking is encountered under 5 p.s.i. at 180° F. for 48 hours. The blocking tests were conducted on film aged 24 hr. after being topped with the liquid.

## Stuart Landes—Consultant

RETIREMENT is too often a boring experience for executives who have lived through an active career in business. Such was the case for W. Stuart Landes, who retired as vice president in charge of the Plastics Div. of Celanese Corp. of America in 1952. He had entered the plastics industry through the old Celluloid Corp. in 1921 and became president of the firm 10 years later. When it was merged with Celanese in 1941, Mr. Landes remained as active head when Celluloid became Celanese's Plastics Div.

Now Mr. Landes has joined Management Counselors, Inc., 37 Wall St., New York 5, N. Y., where his experience and talents in plastics will be available to anyone interested. The other members of the company are also corporation executives who were not happy in their role of retired businessmen.

## High Heat Epoxy

TRADEMARKED Hysol 6000HD, a new high heat distortion temperature epoxy material has been developed by Houghton Laboratories, Inc., 322 Bush St., Olean, N. Y. The material has a heat distortion temperature of over 150° C. and is colored a dark transparent amber. It will be supplied in the form of sheets, rods, and tubes. Custom castings will be made to specifications.

A companion product made by Houghton, for use as a potting compound, has a heat distortion temperature of 120° C. Designated as Hysol 6040 and Hardener AN, this system is suggested for use in potting resistors, capacitors, and other electrical components.

## Adhesive Products

ANNOUNCEMENT of a new peelable protective coating, called Strip-Kote, has been made by Adhesive Products Corp., 1660 Boone Ave., New York 60, N.Y. The coating imparts a tough, transparent film when applied and prevents scratching or marring of highly polished surfaces during fabrication and shipping.

Strip-Kote is a quick-drying liquid that may be brushed on, dipped, or sprayed. It forms a high abrasion-resistant film that can be easily stripped when desired.

The company also announces the development of a new transparent adhesive for adhering metallized plastics. Designated as No. 3799 Metagrip, the adhesive, when used on metallized acetate, butyrate, or polystyrene does not cause the metallic finish to peel or run. It is asserted that with Metagrip, it is also possible to adhere ordinary plastic to metallized plastic. The adhesive is fast-drying and bonded materials can withstand considerable shock. The product can also be used to adhere plastic to metal.

## Self-Adhesive Upholstery

IN CONJUNCTION with Monsanto Chemical Co.'s Plastics Div., a new self-adhesive-backed vinyl fabric has been developed by Comark Plastic Div., Cohn-Hall-Marx Co., 1142 Broadway, New York 18, N.Y.

The material, called Con-Tact, has been laboratory and consumer tested and is expected to find wide application in the do-it-yourself market as a decorative, waterproof, and protective covering for almost any clean, dry, flat surface, as well as on furniture, cabinets, walls, work areas, closets, and shelves, according to the manufacturer.

Con-Tact is made of a new formulation of Monsanto Ultron vinyl film and can be easily cleaned with mild soap and water. Prints including wood grains, nursery, and kitchen patterns, as well as marbleized effects and plain colors, are now available for retail selling through department and chain stores.

## New Insulation Introduced

TWO new insulating materials—NACO Insulation and NACO-Mylar Combination Stock—have been developed for motors, generators, and transformers by National Vulcanized Fibre Co., Wilmington, Del.

NACO Insulation is a special 100% rag-base type of vulcanized fibre which, according to the manufacturers, offers marked economies for users. Having a density lower than that of conventional rag papers, NACO is 20 to 30% less expensive per square foot. It is available in sheets, rolls, and coils in thicknesses up to 1/32 inch.

NACO-Mylar Combination Insulation is standard NACO Insulation combined with Mylar, a polyester film supplied by E. I. du Pont de Nemours and Co., Inc., to form an insulating material possessing high dielectric strength and outstanding toughness. It was developed primarily for motor slot and transformer insulations where dielectric strength



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and toughness are basic requirements. The Mylar film can be applied to one or both sides of NACO Insulation, in thicknesses from 0.0005 to 0.005 inch.

## Sand Core Dryers

FOUNDRIES are able to make any quantity of sand core dryers at a fraction of their usual cost by using Fiberite 4030, a fibrous glass reinforced phenolic high-impact thermosetting material, developed by Fiberite Corp., Winona, Minn.

The company reports that after the first dryer has been cast or machined from metal, duplicates (often hundreds are needed) can then be quickly and accurately made from the new material on an inexpensive, low-temperature, low-pressure press.

In its forming state, Fiberite 4030 flows at only 320° F. under 300 p.s.i. Aging and hardening of dryers require a 6-hr. afterbake at 300° F. Because of its thermosetting nature, the finished dryer will then maintain its high stability up to temperatures of 500° F., according to the manufacturer.

## Release Agents

AN UNUSUAL type of release agent has just been put on the market by Specialty Products Co., 190 Warren St., Jersey City, N. J., and its associate company, Specialty Chemicals Co., 809 N. Artesia St., Santa Ana, Calif.

The material, called Resin Release N, was originally developed as a release agent for fibrous glass laminates and was used on both master molds and plaster castings. Experiments conducted in the compression molding industry lead the producers to believe that this material will be just as effective as a release agent for thermosetting moldings as it has been in the fibrous glass laminates.

Resin Release N is a grease-like material that is cut back with a minimum amount of petroleum derivative. The viscosity is about the same as Vaseline and the color is neutral. It is recommended that the release agent be applied by saturating a piece of cheese cloth with Resin Release N. The cheese cloth does not give off any lint and gives a more even distribution than a brush.

The agent doesn't inhibit cure nor will it attack the resin. Articles taken from the mold after Resin Release N has been used can be painted without degreasing.

The producers emphasize that the material contains no silicone and that its cost is comparatively low. At present, it is 60¢ a lb. in 400-lb. drums, but the material will soon be available in 6-oz. tubes at a low cost.

## Iso-Octyl Producer

PRODUCTION of iso-octyl alcohol has been started at Gulf Oil Corp.'s new plant at Port Arthur, Texas, and shipments of tank car quantities are being offered to manufacturers of plasticizers, synthetic lubricants, surface active agents, and agricultural chemicals. This marks the company's initial move into the general organic chemical market.

The new plant has a capacity of about 9 million lb. of iso-octyl alcohol per year and can be adapted to produce other alcohols.

Previous chemical products of Gulf have either been made for internal consumption or sold under long term contract. Iso-octyl is the first high-grade chemical produced by the company for sale on the open market.

The plant is capable of several alternate oxo syntheses. Besides iso-octyl, it can produce nonyl, decyl, tridecyl, and other higher alcohols.

## Vinyls in Europe

THE market for vinyl film and sheeting has shrunk considerably during the past few years because of increased and improved production on the part of European fabricators and because European styling has progressed substantially in the field of basic designs. This was a comment made by Allan Shedlin, secretary-treasurer of Harte & Co., 267 Fifth Ave., New York 16, N.Y., who has recently returned from a European business tour of seven countries. He reports that so far as fancy or novelty effects are concerned, the American producers are still ahead.

Mr. Shedlin further stated that, quality-wise, American standards in vinyl are much higher than those of most European countries; price-wise, he predicts, American producers will experience greater difficulties in the future in view of lower material prices abroad, particularly for resins.

## Parapol S

AVAILABILITY of Parapol S, the new resin made from polyisobutylene, has been announced by spokesmen for Enjay Co., Inc., 125 Broad St., Elizabeth 4, N. J. As mentioned in the April 1954 Plastiscope (see p. 236), this material, originally known as S Polymer, will be produced in three different grades—S-40, S-50, and S-60. The numbers represent different proportions of styrene monomer content.

Up to now, the resin has looked most promising when used as a blend with other materials for coating paper. It may be used with polyethylene, various types of rubber, polystyrene, wax, and the low-cost hydrocarbon resins like those produced by Pennsylvania Industrial Chemical Corp.

Parapol S may also be extruded into free film which is said to be more impervious to water vapor than cellophane and more transparent than polyethylene.

The resin will sell for 50¢ a lb. during the present developmental period, but there seems to be every likelihood that the price will eventually compare favorably with polyethylene.

## Extrusion Display

INDUSTRIAL companies interested in acquainting themselves with the latest techniques and applications for plastics extrusions can now avail themselves of a portable extrusion engineering display. The unit has been assembled by Anchor Plastics Co., custom extruders, to provide a link between theoretical data on thermoplastic materials and the practical information required for actual product design.

The display contains over 250 parts extruded from the cellulosics,

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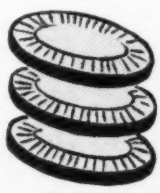
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# THE PLASTISCOPE

acrylic, polystyrene, and other plastics. Also included are numerous pictorial descriptions of applications for extruded plastics parts.

Staffed by Anchor Plastics' engineers, the display is available gratis for one day of plant showings. Interested concerns should address requests to the company at 36-36 36th St., Long Island City 6, N.Y.

## Plastics Cleaner

A CLEANING material for plastics products has been developed by Permatex Co., Inc., 1702-1720 Ave. Y, Brooklyn 35, N. Y., and is now being marketed by the company.

Up until now, this cleaner has been used primarily for cleaning acrylic glazing panels or sheet used in airplanes. The product is applied sparingly with a clean, soft cloth to acrylic surfaces and is said to be an anti-static as well as a fog retarding agent.

Reportedly, the cleaner is just as effective on cellulose acetate sheet or glass as it is on acrylic. The producers believe that the product will be useful on all types of plastic and are inviting inquiries. Samples may be obtained from the company.

## Benzoate Plasticizer

WITH high solvent power for synthetic resins, Flexol 77-G, a new benzoate plasticizer, is now available in tank car quantities from Carbide and Carbon Chemicals Co., a Div. of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N.Y.

The new plasticizer is claimed to have an unusual range of compatibility with synthetic resins. It is completely compatible with polyvinyl chloride, polyvinyl acetate butyrate (37% butyryl content), as well as with cellulose acetate butyrate (17% butyryl content) and cellulose acetate at a 4 to 1 resin-to-plasticizer ratio.

Because of its high solvent power for vinyl chloride resins, 77-G promotes rapid fluxing of calendering and extrusion resins and acts as a fusion aid in organosols and plastisols. It has unusual resistance to extraction by mineral oils and gasoline, being comparable with high-molecular-weight polyesters in this property. The plasticizer is expected to be of particular interest in vinyl flooring compounds, oil- and gasoline-resistant vinyl plastics, and polyvinyl acetate emulsion paints.

Flexol 77-G is priced at 32¢ a lb. in tank car quantities.

## Iso-Octyl Decyl Phthalate

NOW available from Pittsburgh Coke & Chemical Co.'s Plasticizer Div., Pittsburgh, Pa., is an iso-octyl decyl phthalate plasticizer with a claimed lower volatility and a higher degree of permanence than D.O.P.

Because of its low volatility and high permanence, the material—Pittsburgh PX-118—gives good performance in high-temperature processing cycles and in calendering and coating operations involving the exposure of large surface areas.

Vinyls plasticized with PX-118 are approximately equal in low-temperature flexibility to those plasticized with D.O.P., according to the producer.

According to company literature, plastisols prepared with PX-118 are approximately equal in viscosity to D.O.P. in the initial stages, but are characterized by superior viscosity stability as the compound ages.

## Cement for Styrofoam

FIELD installation of Styrofoam insulation to wet tanks, pipes, ducts, and even under water to many surfaces, is now claimed possible by Hayes Adhesives Co., Inc., Div. of Morningstar, Nicol, Inc., Union Blvd. at Brown Ave., St. Louis 15, Mo. It is reported that Hayes Waterproof Insulation Cement #1484 can be applied by brush or spatula to sections of Styrofoam pads, sheets, or pipe covering and immediately bonded into place on a wide variety of wet and low-temperature surfaces, such as are found in industrial plumbing, air conditioning, freezers, and food and dairy plant insulating projects.

Since the adhesive is unaffected by continual sweating of pipes and similar surfaces, no shut-down of equipment and lines is required for installation purposes.

## Plastics from Oil

ANNOUNCEMENT of a new chemical made from oil that may result in a host of pioneer products, has been made by Standard Oil Development Co., 15 W. 51st St., New York, N. Y.

The oil research firm has also reported that Glidden Co., Cleveland, Ohio, has been licensed to develop surface coating uses for the new petroleum derivative, called C-Oil.

Glass-like plastics which may be machined almost like metal have been made from the new product, and unusual electrical properties indicate a possible future use for C-Oil plastics in high-frequency electronic equipment.

C-Oil is a heavy bodied, sticky, almost colorless liquid based on butadiene. At present it is strictly in the experimental stage with very little data available for evaluation.

## EXPANSION

**Shell Chemical Corp.**, 50 W. 50th St., New York 20, N. Y., has purchased the major physical assets of **Lac Chemicals, Inc.**, Culver City, Calif., alcohol producer. The sale includes real estate, inventories, bonded warehouse facilities, and the alcohol denaturing plant which Lac has been operating for 18 years in Culver City.

The Culver City plant will complement the denaturing facilities which Shell already operates in Chicago, Ill., Sewaren, N. J., and Houston, Texas. According to **R. C. McCurdy**, president of Shell, all the product grades previously offered by Lac will be continued.

**H & R Industries**, 344 E. Walnut St., Nazareth, Pa., has acquired an 11-acre tract of land on the outskirts of Nazareth and is constructing a new building which will afford the company about 60% more floor space.

The new building will house four additional extruders for custom work and film production.

**Southeastern Plastics, Inc.**, 106 Western Branch Blvd., Portsmouth, Va., has started construction on a new $25,000 building that will triple in size the company's present quarters. Both mold-making facilities and a complete manufacturing plant




# A Message to Molders . . .

Today, the fast pace set by the plastic industry, requires machinery designed and manufactured to meet the ever increasing demand for more efficient operation through modern techniques.

In contributing to this new era, Impco has developed and now offers a variety of machines to meet those demands.

IMPCO

Impco will continue to develop new equipment, new techniques and will render the same top service to molders and the industry.

We invite your request for more information regarding our complete line of plastic molding machinery—the line which has more and more molders turning to "IMPCO."

## IMPROVED MACHINERY INC.

NASHUA, NEW HAMPSHIRE

# THE PLASTISCOPE

—the result of combined operations between Southeastern Plastics and **Portsmouth Die & Tool Co.**—will be housed in the new building.

Within three years, Southeastern has gone from an 8-hr. day schedule, four days a week, to a round-the-clock operation, six days a week. The company now has operators working on three 8-hr. shifts, keeping two large injection molding machines busy.

**Lustro Plastic Products** has moved into a new building located at 1066 Home Ave., Akron, Ohio. The new building, which has a total floor space of 12,000 sq. ft., provides space for research facilities and the development of new plastics products.

At the present time, Lustro is producing three lines of polystyrene wall tile—Lustr-O-Lite, Vitro-Plas, an 8½- by 8½-in. tile, and Pearlite Pearlescent.

## COMPANY NOTES

**Monsanto Chemical Co.'s Organic Chemicals Div.** has established a new plasticizer bulk station at Greensboro, N. C. Other bulk stations are located in Perth Amboy, N. J.; Akron, Ohio; Everett, Mass.; St. Louis, Mo.; and Los Angeles, Calif.

**General Electric Co.**, Pittsfield, Mass., has established two new units in its Plastics Dept. A sales planning and promotion unit will be managed by **Anthony F. Forni** and a technical service unit by **Harold M. Patterson.**

**Turner Halsey Co., Inc.**, 40 Worth St., New York 13, N. Y., a textile and yarn firm, has organized a new plastics division under the management of **Oscar W. Darge**, formerly of Neuss, Hesslein & Co., Inc. The company has been appointed export representative of **Presto Plastics Products, Inc.** and will offer all varieties of vinyl film and sheeting, as well as flat and tubular film.

**The Goodyear Tire & Rubber Co.** announces that **Roy Wallace** has been named central sales district manager of its **Chemical Div.** and **John H. Drexler** special sales representative. Both appointees will be located at the Cleveland, Ohio, headquarters.

**Tupper Corp.** is installing 40 new Improved Machinery, Inc. 16-oz. injection molding machines in its recently acquired plant at Blackstone, Mass. The Blackstone plant is a former cotton mill converted into a plant for production of Tupperware polyethylene products. It is an addition to the Tupper molding plants at Farnumsville and Fisherville, Mass., Montreal, Que., and the distribution plant at Orlando, Fla.

**Durez Plastics & Chemicals, Inc.**, N. Tonawanda, N. Y., announces that **Edward W. Mathias** has been appointed treasurer of the company and **Richard B. Miller** assistant secretary. Mr. Mathias has been functioning as assistant treasurer for some time, but Mr. Miller's appointment marks his start as an officer of Durez.

**John F. Snyder, Jr.** has been named superintendent of Durez' new phenolic resins plant at Kenton, Ohio, and **Herbert A. Rooney, Jr.**, chief engineer.

**Melamine Plastics, Inc.**, Winona, Minn., has announced that the new price of Melamine 2014 molding compounds is now 56.5¢ a lb. F.O.B. Winona, Minn., freight equalized with Bound Brook, N. J.

**Koppers Co., Inc.**, has moved its New York sales office to 430 Park Ave.

**The Dow Chemical Co.**, Midland, Mich., has opened a new field office at 2330 Victory Parkway, Cincinnati, Ohio, to serve the surrounding territory. The office will be under the direction of **Fielding H. Yost, Jr.**, manager of the Cleveland office.

**National Vulcanized Fibre Co.**, Wilmington, Del., has formed a new advertising and promotion department under the supervision of **William H. Brown**, formerly director of public relations and promotion for the *Wilmington Sunday Star.*

Last year National achieved its second largest sales volume in history. It is now constructing new laboratory facilities at Yorklyn to house its research division, and is continuing an extensive expansion program for plants and equipment. Company plants are already located in Wilmington, Yorklyn, and Newark, Del.; Kennett Square, Pa.; Chicago, Ill.; Johnston City, N. Y.; and Toronto, Canada.

**Monsanto Chemical Co.**, St. Louis, Mo., has elected **John C. Warner** of Texas City, Texas, secretary-treasurer of **Mobay Chemical Co.** Mobay is a newly-formed company, jointly owned by Monsanto and **Farbenfabriken Bayer, A. G.**, Leverkusen, Germany.

Mobay will manufacture isocyanate chemicals.

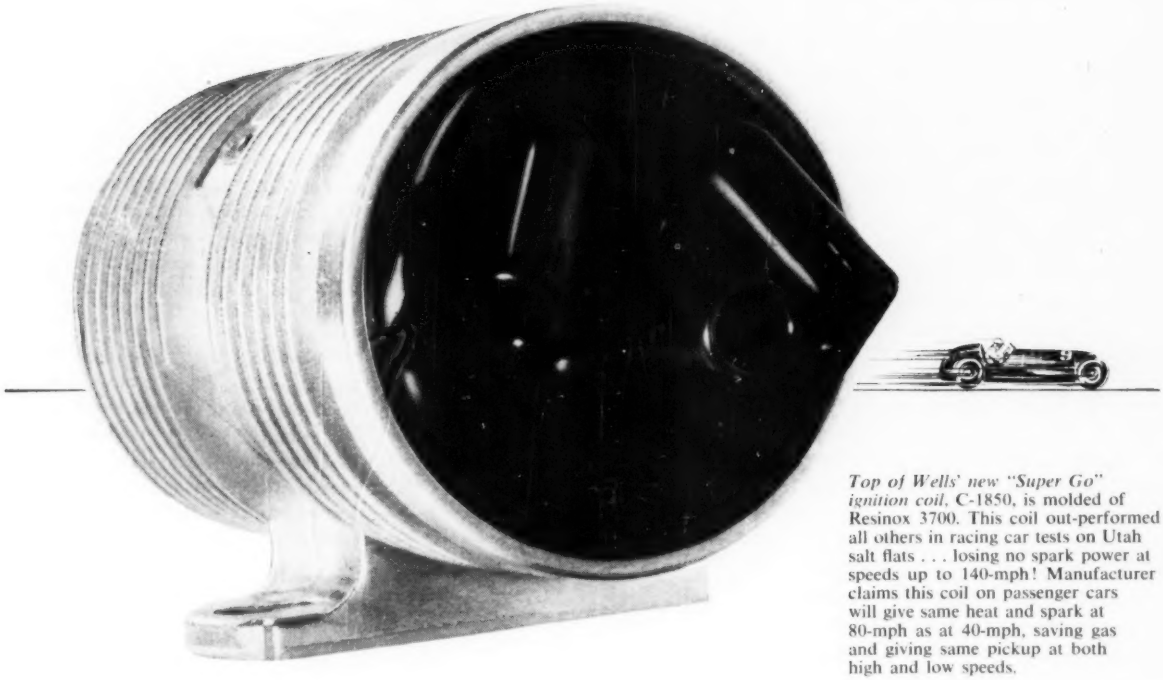
**Plastic Glass Corp.**, 35 Ave. T, Newark 5, N. J., announces that in addition to its regular line of clear cast acrylic rods in various diameters, it is now manufacturing striated pearl, two-tone, and solid-colored cast acrylic rods for pocketbook handles, buttons, knife handles, and similar applications.

**Cadillac Plastic Co.**, Chicago, Ill., recently conducted a discussion clinic in which the many ways Plexiglas can be used in signs were described in detail. Demonstration talks at the sign clinic covered technical points about the acrylic signs. Various examples of signs and letters were exhibited, and a demonstration of the forming of a letter from a heated Plexiglas sheet was held in front of the audience.

**Du Pont** announces that **William F. Leach**, who has been associated with the development of the company's plastics business for over 12 years, has been appointed manager of a new district office for plastics sales at 1616 Walnut St., Philadelphia, Pa. Assigned as salesmen at the Philadelphia office are **Alfred W. Lauck** from the New York district, **Ernest F. Widlund** from Detroit, and **James R. Louden**, recently transferred to the plastic sales group from the plant near Parkersburg, W. Va.

**Shell Chemical Corp.**, 50 W. 50th St., New York, N. Y., has reorganized its Marketing Dept. and announces the following appointments: **G. W. Huldrum, Jr.** has been named to the new post of general sales manager and will supervise management of sales groups and chemical products managers. **W. E. Keegan**

# Takes 22,000 sparks per minute at 140-mph... without electrical loss!



*Top of Wells' new "Super Go" ignition coil,* C-1850, is molded of Resinox 3700. This coil out-performed all others in racing car tests on Utah salt flats . . . losing no spark power at speeds up to 140-mph! Manufacturer claims this coil on passenger cars will give same heat and spark at 80-mph as at 40-mph, saving gas and giving same pickup at both high and low speeds.

# RESINOX 3700

Wells Manufacturing Company of Fond du Lac, Wisconsin, needed an ignition coil top that combined tremendous arc and heat resistance with outstanding dimensional stability and toughness. After extensive tests, they selected Monsanto's thermosetting molding powder, Resinox 3700. Speed test results proved the wisdom of their choice!

Resinox 3700 is the ideal all-around material for magneto ignition, motor control and electronic circuits, and other electrical applications.

1. It combines high arc-resistance with excellent dimensional stability. Eliminates undesirable after-shrinkage.
2. It has relatively good impact resistance and outstanding moldability, including good transfer molding properties.
3. It offers superior heat resistance.

Perhaps Resinox 3700 is exactly what *you* need to solve an electrical equipment problem. Write today for full information!

Resinox: Reg. U. S. Pat. Off.

MONSANTO®

SERVING INDUSTRY...WHICH SERVES MANKIND

MONSANTO CHEMICAL COMPANY, Plastics Division, Room 2608, Springfield 2, Mass.
Please send me complete information on Monsanto's new Resinox 3700 arc-resistant material.

Name & Title _____

Company _____

Address _____

City, Zone, State _____

# THE PLASTISCOPE

has been appointed sales manager and will be responsible for the marketing districts, including Los Angeles, San Francisco, and the nine districts formerly in the eastern division. **A. Jonnard** is now manager of the newly-formed trade analysis department and will operate as part of Mr. Keegan's staff. **C. P. Boutte,** chief engineer of the ammonia plant in Ventura, Calif., has been appointed chief engineer of the Norco plant.

The Norco plant, which is expected to be completed early in 1955, will produce allyl chloride and chlorohydrins. It will increase Shell's glycerine production by more than 25 million lb. per year and will make available substantial additional quantities of epichlorohydrin and Epon resins.

**Consoweld Corp.**, Wisconsin Rapids, Wis., has added the following 10 new distributor outlets to its national wholesale organization: **H. J. Wood Co.**, Boise, Idaho; **Ashton Wholesale Service, Inc.**, Des Moines, Iowa; **Wholesale Flooring, Inc.**, Denver, Colo.; **Building Specialty Distributors, Inc.**, Charlotte, N. C.; **Georgia Metal Mouldings,** Atlanta Ga.; and **Tennessee Concrete & Supply Co.**, Knoxville, Tenn.

**The Carborundum Co.**, Niagara Falls, N. Y., announces that **Semon H. Stupakoff,** formerly president of Stupakoff Ceramic & Mfg. Co., Latrobe, Pa., has been elected vice president of Carborundum.

The Stupakoff firm, which manufactures ceramic and other components used in the electrical industry, was acquired by Carborundum early in 1954 and was recently made a division of the company. Mr. Stupakoff will continue to direct the activities of the division.

**The Goodyear Tire & Rubber Co.** announces that **E. J. Dunlavy, Jr.**, former New York vinyl film sales representative, has been transferred to the company's vinyl film sales staff in Akron. **R. W. Malarney** replaces Mr. Dunlavy in New York. Mr. Dunlavy has been with Goodyear since 1946. Mr. Malarney comes to the company after serving the New York and New England areas while associated with several other firms in the plastics field. He will report to **W. J. O'Keefe,** New York district manager of films.

**California Reinforced Plastics Co.**, 951 Sixty-first St., Oakland 8, Calif., has purchased Hexcel Products Co. The corporate organization will be known as **Hexcel Products Co.** and will operate as a division of California Reinforced Plastics Co.

**Pittsburgh Plate Glass Co.'s Fiber Glass Div.**, Pittsburgh, Pa., announces four sales appointments as follows: **Paul D. Kaley** has been named textile sales manager and **Charles B. Keown** manager of super-fine sales. **Albert W. Stevenson** succeeds Mr. Kaley as manager of the New York district sales office. **Robert M. Hoffman** is now manager of the Chicago district sales office.

Mr. Kaley, who has headed the New York office since he joined the company in 1952, will continue to maintain his New York headquarters. In his new post, he will supervise the sale of all textile products. Mr. Keown was formerly Chicago district sales manager. Mr. Stevenson and Mr. Hoffman were sales representatives in the Fiber Glass Div.

**Pittsburgh Coke & Chemical Co.**, Pittsburgh, Pa., reports that **Dr. J. W. Zabor** has been appointed to the newly created position of assistant to **W. K. Menke,** vice president of chemicals. Dr. Zabor will be particularly concerned with the company's over-all technical program. **Dr. E. O. Ohsol** succeeds Dr. Zabor as director of research. He has been director of chemical engineering since joining the firm in 1952.

**W. H. Coe Mfg. Co., Inc.** has moved to larger offices at 2140 S. Oak Pk. Ave., Berwyn, Ill. **Charles F. Lemon** has been named manager of the new office. Coe specializes in the manufacture of hot die stamping foils.

**R. M. Hollingshead Corp.**, Camden, N. J., announces that **Reid W. Malcolm, Jr.** has been named director of research and development. He succeeds Albert E. Moore, former vice president in charge of research. Mr. Malcolm came to the company in January 1954 from The Dow Chemical Co. **Philip Jones** has been elected secretary of the corporation and assistant to the president. He joined Hollingshead in 1952 as assistant to the director of sales and merchandising. Mr. Jones was formerly affiliated with Montgomery Ward & Co. for 20 years in various executive capacities.

**H. L. Barnebey,** Chemical Processes, P. O. Box 144, Pittsburgh 30, Pa., has prepared a list of chemical processes and products being offered for license. This compilation is available upon request to the interested companies.

**Celanese Corp. of America** announces that **Dr. William L. Evers,** formerly assistant manager of the Summit, N. J., research laboratories in charge of the Plastics Div.'s research, has been named assistant to the technical director of the division, with offices at 290 Ferry St., Newark, N. J. **Dr. O. V. Luke,** formerly chief physical chemist of the Clarkwood, Texas, petroleum chemical laboratory, succeeds Dr. Evers as assistant manager in charge of the division's research in Summit.

**Richard J. Savage** has been appointed director of sales of the **Marco Products Dept.** of the Plastics Div., Linden, N. J. He was formerly director of product application of the department.

**Resistoflex Corp.**, Belleville, N. J., has opened a new office and assembly station at 4414 W. Jefferson St., Los Angeles 16, Calif. **Robert E. Bowen,** for several years the company's West Coast representative, will manage the new office.

This step has been taken to merchandise the company's Fluoroflex-T R500 and R3800 for the West Coast aircraft industry. The hose was developed specifically to handle the newer fuels and synthetic lubricants required in the latest jet engines.

**Adamson United Co.**, Akron 4, Ohio, announces the election of **Norman J. Elder** as vice president and manager of the **Calender Div.** and **H. P. Lamb** as vice president and manager of project engineering. Mr. Elder joined the company in 1946 as an engineer and subsequently became manager of production and

sales of calenders and calender accessories, as well as Rotocure machines. His former affiliations were with B. F. Goodrich Co.'s Physical Testing Laboratory and Morse Instrument Co., Hudson, Ohio. Mr. Lamb joined Adamson in 1931.

**Resin Research Laboratories, Inc.** announces the opening of its new laboratory at 406 Adams St., Newark 5, N. J. The laboratory will comprise sections devoted to resin and polymer synthesis; molding, extrusion, casting, laminating, and calendering; adhesives; and other phases of the chemical industry.

**Gries Reproducer Corp.**, 125 Beechwood Ave., New Rochelle, N. Y., has appointed **Carl E. Von der Heide**, Detroit, Mich., to represent the company in the state of Michigan and northeast Indiana. He will offer the GRC threaded fastenings and other standard industrial components and GRC services in contract production of tiny zinc die castings and nylon moldings.

## PERSONAL

**Charles V. Nicholson** has joined **F. J. Stokes Machine Co., Inc.**, 5500 Tabor Rd., Philadelphia 20, Pa., as export product manager. Mr. Nicholson is presently vice president of the Foreign Traders Assn. of Philadelphia and chairman of its educational committee which conducts forums for export sales managers.

**W. D. Holland** has been named manager of manufacturing of **American Cyanamid Co.'s Plastics and Resins Div.** He had formerly served as production manager of the company's Agricultural Chemical Div. and as assistant to the vice president in charge of manufacturing.

**Millard Demarest** has been named industrial sales manager of **Curtiss-Wright Corp.'s Plastics Div.**, Carlstadt, N. J.

**Dr. William C. Goggin,** manager of **The Dow Chemical Co.'s Plastics Technical Service** since 1947, has received the honorary degree of Doctor of Science from Alma College, Alma, Mich. He was graduated from the institution with a B.S. degree in 1933.

Dr. Goggin joined Dow in 1936 and has served in the Physical Research Laboratory as assistant manager and manager of plastics sales, and as manager of plastics development. Dr. Goggin now directs extensive laboratory facilities and handles the field development of new plastics materials.

**T. C. Keeling, Jr.**, who has directed Mathieson Chemical Corp.'s Hydrocarbons Div. since March 1953, has rejoined **Koppers Co., Inc.**, Pittsburgh, Pa., as assistant vice president of the **Chemical Div.** Prior to joining Mathieson, Mr. Keeling was assistant vice president of the Koppers Chemical Div. in charge of sales. In his new post, he will concern himself principally with the expansion of the division through acquisition of other companies.

**John E. Biegner** has been appointed New York district manager of the Synthetics Dept. of **Hercules Powder Co., Inc.**, Wilmington, Del. He succeeds Paul Lefebvre who will resign from the company on August 31 because of ill health. Mr. Biegner will be in charge of the sales of Hercules' synthetic resins, pentaerythritol, plasticizers, and surface-active agents.

**Arthur C. Treece** is now manager of marketing of **General Electric Co.'s** Laminated and Insulating Products Dept., Coshocton, Ohio. Mr. Treece joined the company at Fort Wayne in 1922. In 1937, he was made district sales manager of the Plastics Dept.'s Chicago office and was transferred to the Plastics Dept. in 1945 as manager of the Pittsfield Molded Products plant.

**Simon Askin,** president of **Heyden Chemical Corp.**, 342 Madison Ave., New York 17, N. Y., has been elected president of the Armed Forces Chemical Association, New York Chapter. Mr. Askin succeeds Major General William N. Porter, U.S.A. retired, chairman of the board of Chemical Construction Corp. **Carlton Bates,** executive vice president of **Solvay Process Div., Allied Chemical & Dye Corp.**, was elected first vice president.

**Orville E. Isenburg** has been appointed manager of **Harmon Colors** of **B. F. Goodrich Chemical Co.** Mr. Isenburg will direct all operations of the company's color business which serves various industries, including plastics, paints, printing inks, rubber, and textiles. The main color pigment plant in Haledon, N. J., will be headquarters for this newly integrated operation. Another plant, making chemical intermediates and color dispersions, is located in Kearny, N. J.

Mr. Isenburg joined The B. F. Goodrich Co. in 1941. After working on plastics and rubber research, he became a member of the sales staff in 1942. In 1944, he was transferred to the chemical division, which later became B. F. Goodrich Chemical Co. When the former Harmon Color Works became a part of B-F-G Chemical Co. in 1953, Mr. Isenburg was appointed sales manager for Harmon Colors.

**Dr. C. A. Sears, American Cyanamid Co.**, has been elected chairman of the newly-formed Chemical Marketing and Economics Group of American Chemical Society's New York Section.

**Ralph G. Gulley** has been named consulting architect for **St. Regis Paper Co.'s** decorative Panelyte. Prior to the appointment, Mr. Gulley served as consulting architect to Durisol, Inc. Before that he was a partner and chief architect of Donald Deskey Associates, industrial design consultants, for seven years.

**William F. Hulse,** formerly technical sales engineer covering the Philadelphia district for **Certain-teed Products,** Ardmore, Pa., is now manager of technical sales, handling the Eastern division. The company's Densite, a high-strength gypsum cement, is used in vacuum forming and other types of patterns and molds.

**Wesley C. Hawkins** has been appointed sales supervisor of the new converting division of **Canadian Resins & Chemicals Ltd.** A sales representative with the company's consumer division since 1945, Mr. Hawkins has taken over his new duties preparatory to the opening of the printing and embossing plant built by the company at Ste. Therese, Que.

**Edward A. Terhune** has been named advertising and sales promotion manager of **Consoweld Corp.**, Wisconsin Rapids, Wis.

**Robert W. Rosel** has been elected to the board of directors of **Yardley Plastics Co.**, 142 Parsons Ave., Columbus, Ohio. Mr. Rosel has been associated with the Yardley organization for 20 years and has been

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sales manager since 1945. He is chairman of the Test Procedures Committee, Thermoplastic Pipe Division, of the Society of the Plastics Industry.

**Victor G. Bartram**, president of **Shawinigan Chemicals Ltd.** and executive officer of other Shawinigan chemical enterprises in Canada, the United States, and the United Kingdom, has been appointed honorary consul of Peru in Montreal, representing the republic in the province of Quebec. As honorary consul, Mr. Bartram will deal with visa applications, commercial arrangements, ship manifests, and other business between Quebec and Peru, as well as act for the South American nation on official occasions in the province.

**Ward B. Sanford** has been promoted to sales engineer of plastics pipe of **Minnesota Mining & Mfg. Co.**, St. Paul, Minn. He will be responsible for the investigation of potential markets for plastics pipe, supervision of field test installations, and for introductory sales.

**Robert S. Price** has been named general manager of **Seiberling Rubber Co.'s** new **Plastics Div.**, Akron 9, Ohio. He will be responsible for all operations of the division, which was formed late in 1953. Seiberling will process rigid plastics in a new plant now being built in Newcomerstown, Ohio. Mr. Price was formerly general manager of B. F. Goodrich Co.'s Plastics Div. at Marietta, Ohio.

**Dr. Carl F. Prutton** has been appointed vice president and technical director of **Food Machinery & Chemical Corp.'s Chemical Divs.**, 161 E. 42nd St., New York 17, N. Y. From 1942 to 1944, Dr. Prutton was chief of the Process Development Branch, Office of the Rubber Director. In 1948, he joined Mathieson Chemical Corp. as director of research.

**William M. Cook, Jr.** is now sales manager of **Extruded Plastics, Inc., Vick Chemical Co.** subsidiary with plants in Norwalk, Conn., and Marion, Ind., according to an announcement by **Charles E. Slaughter**, president and general manager of Extruded Plastics. Mr. Cook's headquarters will be in Norwalk, Conn.

**J. A. Field**, assistant manager of the Fine Chemicals Dept. of **Carbide and Carbon Chemicals Co.**, a **Div. of Union Carbide and Carbon Corp.**, has taken a six months' leave of absence from his job to be a consultant to the chemical division of the Business and Defense Services Administration, U. S. Dept. of Commerce. He is slated later to become assistant administrator.

**J. Alan Hodder** has been appointed New England district sales manager of **Bradley Container Corp., Maynard, Mass.**, producer of polyethylene collapsible tubes and squeeze bottles, according to **Henry E. Griffith**, vice president and general sales manager.

Mr. Hodder has been a member of the Massachusetts legislature since 1946 as Representative for the 8th Middlesex district.

**Sven O. Beckman** has been named vice president in charge of operations of **Autograf Brush & Plastics Co.**, Watervliet, N. Y., a **Johnson & Johnson** subsidiary. He has been treasurer of Autograf and will continue to function temporarily in that capacity. Prior to joining the company, Mr. Beckman was resident controller of Personal Products Corp., another Johnson & Johnson subsidiary.

**G. S. Brown** has been appointed assistant manager of research of **Plax Corp.**, Hartford, Conn. Prior to joining Plax, Mr. Brown was active for 13 years in the extrusion of plastics for the Wire & Cable Div. of Western Electric Co., Chicago, Ill.

**Aribert J. Lehmann** has become a partner with **Michael Schwartz** in the operation of **Vacu-Form Corp. of America**, 426 Union Ave., Brooklyn, N. Y. The company does custom vacuum forming.

**E. C. Patterson** has been named general manager of **Reynolds Chemical Co.**, Ann Arbor, Mich., a division of **Reynolds Spring Co.**, Jackson, Mich. Mr. Patterson was previously associated with Michigan Chrome & Chemical Co. as manager of its Technical Dept. and with Stoner-Mudge Co.

**C. F. Galehouse** has recently taken over the sales agency for **Tamco Press**, 290 Broadway, Huntington, N. Y., and **Mastercraft Research Laboratories**, 95-32—150th St., Jamaica, N. Y. He will handle the sales of the hydraulically operated, vacuum forming machine, manufactured by Tamco, as well as design and build electro-formed vacuum forming molds.

## MEETINGS

**July 25-28**—Washington Gift Show, Hotel Willard, Washington, D. C.

**August 2-13**—Merchandise Mart Gift Show, China, Glass, and Pottery Market, Chicago, Ill.

**August 15-18**—Western Merchandise Exhibitors Assn., Pacific Northwest China, Glass, Gift, Stationery, Jewelry, Toy, and Housewares Show, Civic Auditorium, Olympic and New Washington Hotels, and Terminal Sales Bldg., Seattle, Wash.

**August 17-19**—Western Packaging & Materials Handling Exposition, Civic Auditorium, San Francisco, Calif.

**August 22-27**—National Gift and Art Assn., New York Gift Show, Hotels New Yorker and Statler.

**Sept. 12-16**—American Institute of Chemical Engineers, Meeting, Hotel Colorado, Glenwood Springs, Colo.

**Sept. 21-23**—Society for Experimental Stress Analysis, Annual Meeting and Exhibition in Conjunction with First International Instrument Congress and Exposition, Bellevue-Stratford Hotel, Philadelphia, Pa.

**Sept. 23-26**—Packaging Machinery Manufacturers Institute, Twenty-second Annual Meeting, Grove Park Inn, Asheville, N. C.

**Oct. 12-15**—Chicago Section of the American Chemical Society, Eighth National Chemical Exposition, Chicago Coliseum, Chicago, Ill.

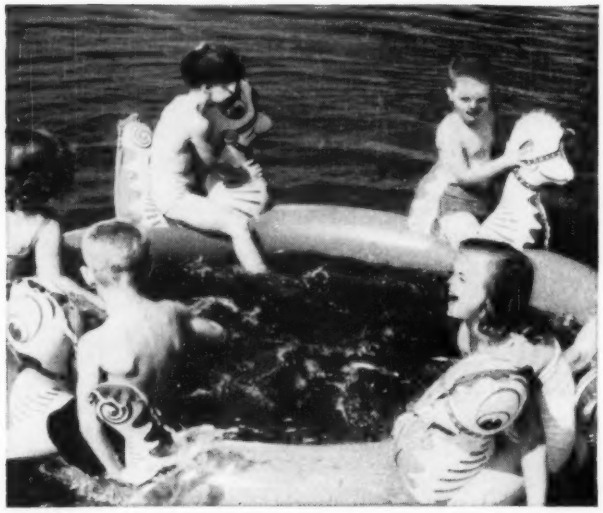
**Oct. 26**—Association of Consulting Chemists and Chemical Engineers, Inc., Annual Symposium and Banquet, Hotel Belmont Plaza, New York, N. Y.



*. . . scuff, stain and wear-resistant*



*. . . flexible, durable, absolute water proofing*



*. . . colorful, rugged, weather-resistant*

*these and many other vinyl plastic products enjoying an increasing consumer demand—are made with economical and effective*

# D-I-O-P

*(di-iso-octyl phthalate)*

the fastest growing plasticizer used in vinyl sheetings, extrusions and plastisols.

*D-I-O-P is available from leading plasticizer manufacturers* under their brands featuring individual characteristics.

*ENJAY does not manufacture D-I-O-P or any other plasticizer* but supplies the uniform high quality ENJAY ISO-OCTYL ALCOHOL from which D-I-O-P is made.

Ask your supplier of plasticizers for D-I-O-P.

ENJAY

34 successful years of leadership in serving industry

**ENJAY COMPANY, INC.**
**15 West 51st Street • New York 19, N.Y.**

# CLASSIFIED ADVERTISEMENTS

MODERN PLASTICS reserves the right to accept, reject or censor classified copy.

**EMPLOYMENT • BUSINESS OPPORTUNITIES • EQUIPMENT (used or resale only)**

## MACHINERY and EQUIPMENT FOR SALE

HYDRAULIC PRESSES: 1—Erie Belt Press, 4242 Tons, 2—8" openings, 18'-0"x52" Steel Steam Platens, 6 rams—30" dia. x 16" stroke. 1—Birdsboro, 2000 Tons, down-acting ram 34" dia. x 14" stroke, 48" DLO, 42"x42" bed area. 1—HPM, 750 Tons, down-acting, ram, 28" dia. x 42" stroke, 72" DLO, 59"x44" bed area, MD, low and high pressure pumps and accumulator system. 1—Clearing, 500/1500 Tons, completely self-contained with controls for manual or automatic operation, suitable for compression and injection molding. 1—Farrel, 393 Tons, 48"x48" Steam Platens, 2—15" openings, 4 rams 10" dia. x 24" stroke, approx. 15" per opening. 1—Baldwin-Southwark, 400 Tons, slab-side, 30"x30" Steel Steam Platens, 23" DLO, ram 21"x17" stroke. 1—Baldwin-Southwark, 200 Tons, 3-opening, 20"x20" Steel Steam Platens, ram 12"x20" stroke, 3500 PSI. 1—Southwark, 200 Tons, 2-opening, 30"x30" Steel Steam Platens, ram 14"x14" stroke. 1—Thropp, 150 Tons, 36"x36" Steel Steam Platens, 15" DLO, ram 14"x12"stroke. 1—Watson-Stillman, 100 Tons, down-acting ram 11½"x 9½"x6" stroke, 22"x20" bed, 24" DLO, self-contained, 15 hp md Vickers pump. Unit practically new. 1—Watson-Stillman, 100 Tons, 11¾"x12" platens, 22½" DLO, ram—8" dia. x 15" stroke, complete with 3 hp md pump. 1—HPM, 100 tons, 18"x18" Platen Area, ram—8" dia. x 18" stroke, 30" DLO, steel cylinder—4000 psi. 2—Burroughs, 75 Tons, down-acting, 17½"x17" Electric-Heated Platens, 13½" DLO, ram—8" dia. x 10" stroke, complete with 7½ hp md oilgear pump. 1—HPM, 35 Tons, down-acting ram 6" dia. x 6" stroke, 15" DLO, 12"x6" bed area, self-contained. 1—Indusco Laboratory Press, 12 Tons, Hand Operated, 8"x8" Electrically Heated Platens. NEW. INJECTION MOLDING MACHINES: 1—Plasticor Vertical 2 oz., Electric Heated, Hand Operated. 1—HPM Horizontal Model 54, 2 oz., 22 Ton Clamp, 12 Ton Injection, Manual Control, Oil Heated. 2—HPM Model 200-H, 9 oz., 200 Ton Clamp, 31 Ton Injection, Electrically Heated, Full Controls, Excellent Condition, In Operation. 2—Impco Model VF-822A, 22 oz., 350 Ton Clamp, 100 Ton Injection, Electrically Heated, Full Controls, Excellent Condition. In operation. Also: Plastics & Rubber Extruders, Mills, Mixers, Grinders, Injection Molding Machines, Pumps, Valves, Platens, etc. JOHNSON MACHINERY COMPANY, 683-P Frelinghuysen Avenue, Newark 5, New Jersey. Tel.: BIgelow 8-2500. What have you for sale? What are you looking for?

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SAVE WITH GUARANTEED REBUILT EQUIPMENT: Hydraulic Presses: 2 new R.D. Wood 500 ton 54"x26" platen, 42"x37", 20" ram, 475 tons; 2-7 opening 27"x27", 18" ram, 565 tons; 24"x24" 12" ram, 170 tons; 24"x20" 10" ram, 118 tons; 20"x20" 10" ram, 118 tons; 20"x20" 10" ram, 200 tons; 30"x20" 8" ram, 75 tons; 24"x20" 8" ram, 75 tons; 14"x14" 8" ram, 75 tons; 15"x15" 8" ram, 75 tons; 2-19"x24" 10" rams, 78 tons; 12"x12" 6½" ram, 50 tons; 14"x14" 8" ram, 50 tons; 8" x 9½" 4½" ram, 20 tons; 16"x16" 3½" rams, 12 tons; PREFORM PRESS: Colton 5½T, Reeves Drive and Motor, late type Stokes Model T; LABORATORY PRESSES: Carver & Watson Stillman Units; NEW UNIVERSAL DUAL PUMPING UNITS: 3-15 HP; NEW LABORATORY MILLS, and CALENDERS; EXTRUDER; Modern Plastic late type 3½"; ACCUMULATOR; HPM 6" ram 2500#, also Mixers, Vulcanizers, Injection Molding Machines, etc. UNIVERSAL HYDRAULIC MACHINERY CO. INC., 285 Hudson Street, New York 13, N. Y.

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FOR SALE: Embossing Machine for plastic film, light or heavy gauge. Can be used for laminating and polishing. Rolls 60" face with dual let off and dual take up. Equipped with friction clutches, preheating electric controlled. T & M MACHINE & TOOL CO., 29 Greenpoint Avenue, Brooklyn 22, N.Y. Tel.: EV 9-1964.

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AVAILABLE AT BARGAIN PRICES Colton 2RP and 3RP 10-35 Rotary &#5½ Tablet Machines. Rotex, Tyler Hum-mer, Selectro, Robinson, Raymond, Gayco, Great Western Sifters. Mikro Bantam, 1SH, 2TH, 3W, 4TH Pulverizers; Schutz O'Neill Mills. Baker Perkins Heavy Duty Steam Jacketed, Double Arm, from 12 to 200 gal., Mixers (Unidor and Vacuum also). J. H. Day, from ¾ up to 100 gal., Imperial and Cincinnatus D. A. Jacketed, Sigma Blade Mixers. Day, Robinson, Munson Dry Powder Mixers, 15 to 10,000 lbs., all sizes. F. J. Stokes RBB Rotary and R Tablet Machines. Package Machy. FA, FA4, Miller, Hayssen, Scandia, Oliver Auto. Wrappers. REBUILT AND GUARANTEED—This is only a partial list. Over 5000 machines in stock—available for immediate delivery. Tell us your machinery requirements. UNION STANDARD EQUIPMENT CO. 318-322 Lafayette St., New York 12, N. Y.

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FOR SALE: Leominster 8 oz. Injection Molding Machine complete late type. Plastic and Rubber Equipment. Farrel 16"x48", 15"x36" and 6"x12", 2 roll mills. Mills and Calenders up to 84". New Seco 6"x12" and 6"x16" Lab. Mixing Mills and Calenders. Rubber & Plastic Extruders. Stokes #280, 4" dia. Preform Machine. HPM 200 ton 30" x 48" Platens. 350 ton 22"x24". New Loomis 340 ton, 24"x56" platens. Southwark 350 ton, 42"x24" platens. 200 ton Brunswick 21"x21" Platens, 14" Ram Record Presses. 100 ton 24"x24". Elmes 75 ton 30"x36". Also presses Lab. to 2000 tons from 12"x12" to 48"x48". Hydr. Oil Pumps. Gould 75 HP motor Dr. 2 stage Centrif. Pump 250# W.P. W.S. 4 Pigr. High and Low Pressure Hydr. Pump. HPM 5 GPM 2700 lbs. Elmes Hor. 4 Plgr. 4500 lbs. and 5500 lbs. Hydr. Accumulators. Stokes Automatic Molding Presses. Rotary & Single Punch Preform Tablet Machine ½" to 4". Injection Molding Machines 1 oz. to 32 oz. Baker Perkins Jacketed Mixers 100, 50, and 9 gal. Plastic Grinders. Heavy duty mixers, grinders pulverizers, gas boilers, etc. Partial listing. We buy your surplus machinery. STEIN EQUIPMENT CO., 107-8th Street, Brooklyn 15, N.Y. STerling 8-1944.

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FOR SALE: 1—F.B. 32"x92" inverted-L 4 Roll Calender, reduction drive, d.c. vari-speed motor; 1—Adamson 5'x28' Vulcanizer, quick-opening door, A.S.M.E.; 1—5'x12' quick-opening door, 125 psi. 1—Royle #4 Extruder, motor driven. 1—6"x12" Laboratory Mill, m.d. 1—Ball & Jewell #2 Rotary Cutter, 15 h.p. motor. 3—#28 Devine Vac. Shelf Dryers, 19—59"x78" shelves, complete. 1—Farrel-Birmingham 16"x13" 3 Roll Calender. 4—Hymac 150 ton 18"x18" Hydraulic presses, electrically heated platens, 9" dia. rams. 1—Reed 2000 lb. all steel horizontal mixer, outboard bearings. 1—Farrel 20"x 22"x60" mill, top cap frame, falk reduction drive, 100 h.p. motor. 2—Farrel 16"x42" Mills with reduction drive and 100 h.p. motor. Also other sizes: Hydraulic Presses, Tubers, Banbury Mixers, Mills, Vulcanizers, Calenders, Pellet Presses, Cutters. Send us your inquiries. What have you for sale? CONSOLIDATED PRODUCTS CO., INC., 50 Bloomfield Street, Hoboken, N. J. HOboken 3-4425. N. Y. Tel.: BArclay 7-0600.

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(5) NEW WATSON-STILLMAN EJECTION Molding Heating Chambers, one four ounce, one six ounce, two eight ounce, one sixteen ounce. Price one third the cost of new. New 75 ton presses, size 22x22, 10" ram, 10" stroke, $1100 each, ten day delivery f.o.b. Brooklyn, New York, one or more can be obtained. HYDRAULIC SAL-PRESS CO., INC., 388 Warren Street, Bklyn., N.Y.

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MARKING EQUIPMENT, Apex 2 color, full automatic printer for cylindrical items, complete with take off conveyor, can be motorized. Best offer over $500. Also, Peerless AMW Air Power Hot Stamping Press. Best offer over $100. ROSENBERG BROS. & CO., Smithtown, N. Y.

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FOR SALE
One 4 ounce and one 8 ounce
Reed Prentice Molding Machines.
F. J. KIRK MOLDING CO., INC.
Clinton, Mass. Tel.: Clinton 1871

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KUX MODEL 25 AND STOKES RD3 Rotary Presses; B & J Rotary Cutters #1½ and Standard Ideal; Mikro Pulverizers Bantam, #1-SH, #2-SI, #2-TH; B.P. 50 HP, 50 gal. Sigma Blade Jacketed Mixer; W & P 100 gal. Mixer and 1 qt. and 10 gal. Stainless Steel Mixers. Large stock steel and stainless steel tanks and kettles. PERRY EQUIPMENT CORP., 1429 N. 6th Street, Philadelphia 22, Pa.

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FOR SALE: Injection Presses: 4, 8, 16 & 22 oz. Reeds, 4, 9, 16 oz. HPM, 15 oz. Crown Moldmaster, 3 oz. Moslo, 1 oz. VanDorn. Scrapgrinders, Ovens. Compression & Transfer presses: 50, 100, 250 tons. Stokes Automatic 50 tons 235 A, Stokes Standard Transfer 258. Preform presses. 42" Slitting & Rewind machine, 3 HP Gasboilers. McBeth Daylite Testbooth, Equipment to be inspected in operation. List your surplus equipment with me. JUSTIN ZENNER, 823 Waveland Ave., Chicago 13, Ill.

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EVEREADY HAS . . . Modern injection moulding machines . . . Late type extruders; mixers & blenders . . . Hard to find special machines . . . For satisfaction let us know your needs. . . .
EVEREADY
805 Housatonic Avenue, Bridgeport, Conn.

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FOR SALE: Hobbing Press 800 Ton W.S. (2) 300 Ton W.S. Presses 20x20 & 29x24 Platens. 140 Ton W.S. 22x16 Platen. 85 Ton Waterbury Farrel 20x24 Platen. 63 Ton Press 15x15 Platen with Pullback Cyls. 9, 8, 4, Oz. Injection Molding Machines. 15 Ton Lab. Presses 10x8 Platen. 10 Ton Lab. Presses 6x6 Platen. Ball & Jewell Plastic Grinders. Standard Mystic Embossing Presses, Accumulators, Pumps, Valves. Many other Presses—Send For Bulletin. New Presses Built to Suit Your Requirements. AARON MACHINERY CO., INC., 45 Crosby St., New York 12, N. Y. Tel. WOrth 4-8233.

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FOR SALE: (1) 50 Ton Stokes Automatic Molding Press; (1) 4 oz. Watson-Stillman Injection Molding Press; (2) 5 HP Vickers Hydraulic Power Units; (2) 3 HP Single Phase Vickers Hydraulic Power Units; (2) 10" dia. Two-way Hydraulic Cylinders 14" stroke; (5) 6" dia. Air Cylinders—30" stroke; (1) 20 Ton Hydraulic Press 10" Cylinder—22x30" Platens. JOHN F. CARSON, A & Venango Sts., Philadelphia 34, Pa. GArfield 6-2221.

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FOR SALE: Plastic Moulding Machines, very reasonably priced: 2 used 8 oz. injection moulding machines in good working condition. May be seen in operation. VAN BRODE MILLING CO., INC., Clinton, Mass. Phone: Clinton 2190.

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LUPOMATIC FINISHING & TUMBLING BARREL, 2 Compartments, Steel shell wood lined, Angle frame 2'x4'x6', like new used 2 weeks, complete with ½ H.P. Motor Drive, 6 assorted mesh pans. $125.00 F.O.B. Plant, MECO INC., Napoleon, Ohio.

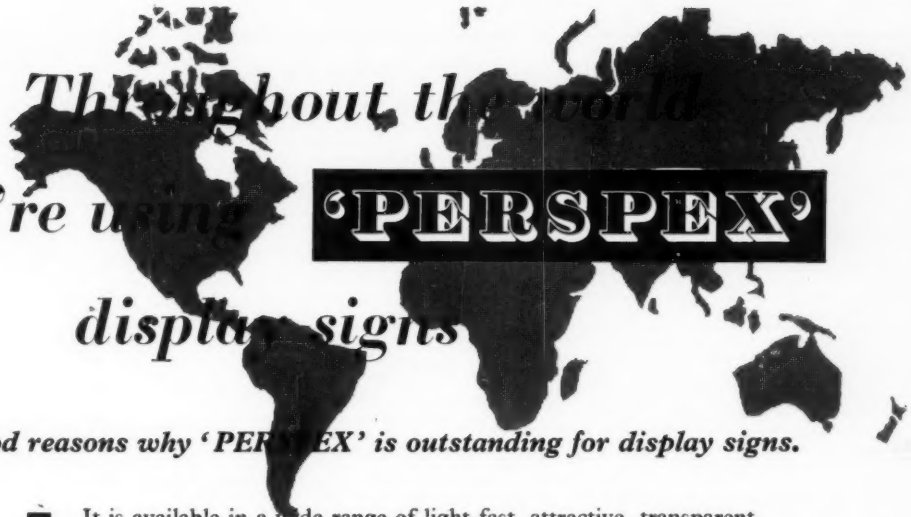
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FOR SALE: Laminating press Watson-Stillman 50 ton with hand pump, air advance, pressure gauge, 1 pair electric heating plates and 1 pair water cooling plates. Good condition. Reply Box 2038, Modern Plastics.

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FOR SALE: 1—16 oz. h.p.m. Injection Molding Press. Press is in excellent operating condition. Inquire GENERAL INDUSTRIES COMPANY, Elyria, Ohio.

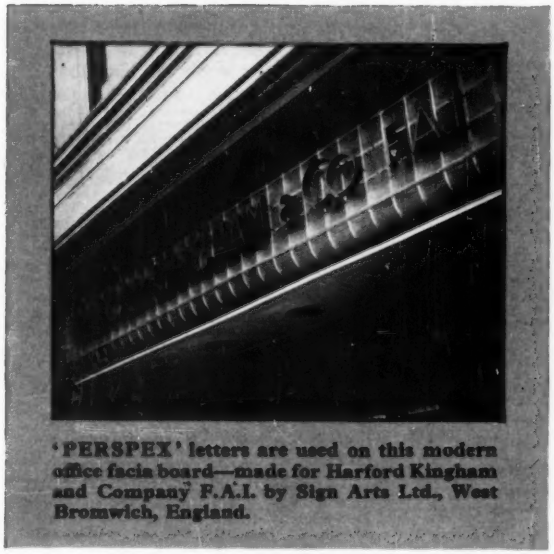
(*Continued on page 246*)



# Throughout the world they're using 'PERSPEX' display signs

***Here are five good reasons why 'PERSPEX' is outstanding for display signs.***

1. It is available in a wide range of light-fast, attractive, transparent, translucent, and opaque colours and also in diffusing opal and clear sheet form.
2. It can be used indoors and out, under all climatic conditions and needs nothing but a wash now and then. It has excellent dimensional stability.
3. Weatherproof and fast colours can be applied to 'PERSPEX' by both silk-screen printing and the integral printing processes.
4. 'PERSPEX' is light and easily fabricated.
5. Both edge and interior light can be used to illuminate 'PERSPEX' signs.



**'PERSPEX' letters are used on this modern office facia board—made for Harford Kingham and Company F.A.I. by Sign Arts Ltd., West Bromwich, England.**




**Shell Oil Co. Sign in 'PERSPEX' made in England by Thermo-Plastics Ltd., Dunstable and in the U.S.A. by Steiner Plastics Mfg. Co. Inc., Glencove, Long Island, New York.**

*'PERSPEX' is the registered trade mark of the acrylic sheet manufactured by Imperial Chemical Industries Ltd.*

ICI

**IMPERIAL CHEMICAL INDUSTRIES LIMITED,**

*Plastics Division, Black Fan Road, Welwyn Garden City, Herts., England*

*U.S.A. enquiries to:* **J. B. HENRIQUES INC., 521 Fifth Avenue, New York 17. N.Y.**

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# CLASSIFIED ADVERTISING

(*Continued from page 244*)

FOR SALE: 1—1200# stainless steel jacketed ribbon blender; 3 Colton 5½ T preform presses, 3"; 3 Plastic mills 10"x16", 10"x20", 12"x 24"; 1 Ball & Jewell rotary cutter 5 HP. Also molding presses, extruders, cutters, etc. CHEMICAL & PROCESS MACHINERY CORP., 146-148 Grand Street, N.Y.C. Tel.: WOrth 6-3430.

FOR SALE: 48 oz. Watson-Stillman, 1952. 32 oz. Watson-Stillman, used 3 wks., $27,000. 16 oz. H.P.M., $11,000. 12 oz. Crown Moldmaster, $10,500. 12 oz. Lester w/16 oz. cylinder. 8 oz. Reed-Prentice, 1946, $8,500. 8 oz. Reed-Prentice, double link, $6,500. 8 oz. Leominster, $5,000. 4 oz. Impco, $8,000. 4 oz. Lester, $3,500. 3 oz. Moslo Minijector. 25 & 50 ton Watson-Stillman angle molding presses, cheap; injection molding machines from 1 ounce to 60 ounces. Abbe grinder. ACME MACHINERY & MFG. CO., 102 Grove St., Worcester, Mass.

HYDRAULIC PRESSES rebuilt, repaired. Used presses from laboratory to 1000 tons standard and special, molding and hobbing presses, etc. Used pumping units up to 10,000 p.s.i. all capacities. CLIFTON HYDRAULIC PRESS CO., 291 Alwood Rd. P.O. Box 325, Clifton, New Jersey.

FOR SALE: Stainless Steel Rotary Dryer, Link Belt Co., 5' 2"x16', No. 502-16, with all auxiliary equipment, Roto Louvre type. Reply Box 2041, Modern Plastics.

## MACHINERY and EQUIPMENT WANTED

WANTED: Plant or Machinery including Rubber Mills, Hydraulic presses, Sturdy mixers, Calenders, Banbury mixers, Pulverizers, Grinders, Rotary cutters, Extruders, Screens, Injection Molding machines, Dryers. CONSOLIDATED PRODUCTS CO. INC., 50 Bloomfield Street, Hoboken, N.J. HOboken 3-4425. N.Y. Tel.: BArclay 7-0600.

WANTED: No. 3 Banbury Mixer, Calender, Extruder, 4 oz. Injection Molding Machine. Advise where can inspect. Reply Box 2040, Modern Plastics.

## MATERIALS FOR SALE

FOR SALE
5,000 lbs. Virgin Pink Polystyrene; 20,000 lbs. each Reprocessed Red, Blue, Green, Gray, Maroon high impact Polystyrene Pellets; 10,000 lbs. Transparent Amber Reprocessed Acetate; 50,000 lbs. Black Reprocessed Acetate Pellets; 20,000 lbs. each Red, Blue, Green, Brown Reprocessed Acetate Pellets. Samples on request.
A. BAMBERGER CORPORATION
703 Bedford Ave., Brooklyn 6, N. Y.
Telephone MAin 5-7450

## MATERIALS WANTED

WANTED: Plexiglas and Lucite scrap, salvage and cut-offs, any quantity. DUKE PLASTICS CORP., 406 Atlantic Ave., Bklyn. 17, N. Y. Ulster 8-9413.

WANTED
Plastics Scrap in rejects of all kinds, ground and unground. Also rejected molded pieces and surplus virgin molding powders. Top prices paid.
A. BAMBERGER CORPORATION
703 Bedford Ave., Brooklyn 6, N. Y.
Telephone MAin 5-7450

## MOLDS FOR SALE

FOR SALE: (4)—Fourteen Cavity compression molds to produce sewing thimbles in Urea compound. Each mold has been in operation in the past six months—Size of thimbles are No. 8, 9, 10, and 11: Also Ninety Thousand thimbles are included with the molds. These are in six colors made of standard urea compound. This is an excellent opportunity to secure a business that is a premium item and also a chain store item. Will sacrifice the entire business for $1850.00. The replacement value of the molds would be $1500.00 for each mold or $6000.00 for the four molds. Please Reply Box 2036, Modern Plastics.

## MOLDS WANTED

MOLDS
If you are interested in selling injection molds for plastic containers, closures, or packaging specialties, please send us samples or photographs of the item, together with your best price for your surplus or unused mold equipment.
Reply Box 2017, Modern Plastics.

BRUSH MOLDS & BRUSH MACHINERY, injection molds for ladies, men's, military, nail, toothbrushes, etc. Send particulars & samples. Box 1000, REALSERVICE, 110 W. 34 St., N. Y. C.

## PLANTS FOR SALE

FOR SALE
Complete wood flour mill. Capacity 10 tons per 24 hours, using nearby supply of pine and poplar. For further particulars, reply Box 2002, Modern Plastics.

CANADIAN
PROGRESSIVE PLASTIC COMPANY
FOR SALE
Sole manufacturers of complete line of plastic sportswear, ladies', men's, children's rainwear and inflatable products entirely electronically sealed. Up-to-date plant and ownership of factory premises. Products are nationally advertised in Canada and United States. Company maintains excellent outlets throughout the country. For complete information: Reply Box 2024, Modern Plastics.

## HELP WANTED

PLASTIC EXTRUSION OPERATOR
With experience in various thermo-plastics, knowledge of dies, fixtures, and able to do own setup. If you are looking for a steady job in an expanding well known firm on Eastern Seaboard where you can use your initiative, contact us. Willing to help right man relocate.
Reply Box 2014, Modern Plastics.

SALES ENGINEER—Injection Moldings or complete items that require Metal Stampings or Screw Machine Parts. Reply Box 2009, Modern Plastics.

WANTED: A man thoroughly experienced in all phases of vinyl compounding. Qualified to install dry blend set-up in plant and produce high quality compound for well established volume manufacturer of vinyl extrusions. Located in Metropolitan vicinity. State experience, and starting salray desired. Reply Box 2028, Modern Plastics.

SALESMAN WANTED: To sell exceptionally good line of Vacuum Forming and Plastic Machinery; also Die Casting Equipment. Reply Box 2022, Modern Plastics.

VINYL CHEMICAL ENGINEER
OR CHEMIST
Experienced on heavy or light gauge calendering. Real opportunity with progressive company.
Reply Box 2007, Modern Plastics.

PLASTICS EXECUTIVES—$5,000 to $25,000. We have immediate openings with leading national concerns for competent men in all phases of the Plastics industry. Rapid, confidential, nationwide service. For application, send your name and address to: E. B. Shea, Plastics Industry Division, DRAKE ENGINEERING PERSONNEL, 7 West Madison Street, Chicago 2, Illinois.

SALES ENGINEER to represent old-established injection molder. Press capacity 4 to 200 ounces. Tool room, painting, silk screening, hot stamping—all conveyorized. Straightline assembly. Automatic packaging equipment. Prefer experienced men and men with industrial contacts. Also men controlling one or more special deals. Large midwest plant. Give complete details. Personal interview to follow. Reply Box 2000, Modern Plastics.

EXCELLENT OPPORTUNITY open for Chemist experienced in manufacture of Polyvinyl Acetate Emulsions or formulation and manufacture of Synthetic Resin Adhesives. Write fully stating experience, background, etc. Reply Box 2043, Modern Plastics.

TECHNICAL SALESMAN
Experienced selling to vinyl compounders. Qualified to represent color manufacturer in Mid-West area. Prefer Ohio residence. Salary $8000-10,000. Bonus plan.
Reply Box 2026, Modern Plastics.

PLASTICS ENGINEER—experienced in injection or compression molding; well versed in tooling and die work; development of efficient production methods. Fine opportunity for able individual between age of 25 & 40 with progressive and well established middle-west company. References and resume of experience to accompany reply. Answers treated confidentially. Reply Box 2033, Modern Plastics.

WANTED — CHEMICAL ENGINEER OR CHEMIST with experience in adhesives and laminating techniques. Location in Deep South. Give complete information, experience and salary requirements. Reply Box 2019, Modern Plastics.

TECHNICIAN CHEMICAL SPECIALIST Management Ebonite and Rubber covering of rollers for Cloth Dyeing and Paper Machines wanted for North Italy. Submit detailed experience. Write to: SPERLING & KUPFER—Piazza San Babila 1, Milano / Italy.

VINYL COLOR MATCHER
Require man experienced in color matching and production color control in vinyl film and sheeting operation.
Reply Box 2030, Modern Plastics.

ENGINEER for reinforced plastic experimental and production work. Must have thorough knowledge of polyester-fiberglass laminating techniques. Bag and matched tooling experience particularly desirable. Excellent opportunity in an established firm in a southwestern state. Submit resume of experience and salary requirements. Reply Box 2003, Modern Plastics.

RESEARCH CHEMISTS; CHEMICAL ENGINEERS, Mechanical Engineers, Physicists. Progressive Midwest concern, due to its expansion program, has currently available permanent positions for technical graduates with industrial experience. Our employees know of these openings. Your reply, giving personal, educational and work history together with salary expected, will be kept in strict confidence. Reply Box 2005, Modern Plastics.

(*Continued on page 248*)

Nelco

. . . If You Use Cellulose Acetate

Here is a Lacquer that gives you both

. . . HIGH GLOSS and

RESISTANCE to SOFTENING

by Plasticiser Migration

IN A SINGLE COAT

Here at last is a lacquer which eliminates the base coating or primer — stops plasticiser migration — will not soften when given the moisture test — and requires no top coating for a high gloss.

In addition to these primary qualities NELCO Cellulose Acetate Lacquers are outstanding in the following:

- Adhesion — no worry about peeling or flaking
- Flow — formulated for easy application by dipping or spraying
- Non-toxic — safe for toys
- Hardness — resists sharp blows
- Fast drying — developed by our laboratory to speed production line operations

*Nelco Cellulose Acetate Lacquers are available in a wide range of colors as well as clear and metallic shades.*




NEW ENGLAND LACQUER CO.
King Philip Rd., East Providence, R. I.



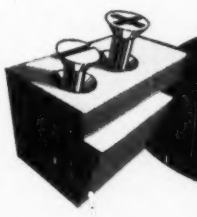
MADE TO EXACTING SPECIFICATIONS

Wood Screws—Phillips or Slotted; flat, round and oval in steel, brass, silicon bronze, aluminum and stainless steel; sizes 3/16" No. 0 to 7" No. 30. Stove Bolts—slotted steel in round and flat head styles.

Packaging: Wood screws and stove bolts in attractive, new, confusion-proof, soil and moisture resistant green boxes with easy identification label. Bulk screws in indestructible steel cans with replaceable lids. Prompt service.

Attractive wood screw catalogue in color and samples free upon request. Box 1360-Y

WOOD SCREWS and STOVE BOLTS



Southern
SCREW COMPANY
STATESVILLE • NORTH CAROLINA

FACTORY WAREHOUSES:
NEW YORK, N. Y.
LOS ANGELES, CALIF.
CHICAGO, ILL.
DALLAS, TEXAS

## CLASSIFIED ADVERTISING

(*Continued from page 246*)

SALES ENGINEER for major manufacturer of vacuum forming equipment. Thermo plastic and mechanical knowledge essential. Several important areas are still available. Please send resume and full particulars to Box 2013, Modern Plastics.

PLASTICS PLANT SUPT. Nationally known plastic concern with 20 injection and extrusion machines is seeking topnotch plant superintendent with thoro knowledge of molding techniques, engineering, tool design, finishing, production control and can administer and direct department heads and 250 employees. Excellent future. Sound organization. Mr. Harry Scheer, president, SUPERIOR PLASTICS INC., 426 N. Oakley Blvd., Chicago 12, Illinois.

WANTED, EXTRUDER for covering wire and cable. Must have all around experience in extruding plastic covered wire and cable, for the west coast. Good opportunity for right man. Reply Box 2023, Modern Plastics.

CHEMIST WANTED—Capable of manufacturing urea-formaldehyde molding material. Must be experienced and able to take full responsibility. Our people know of this ad. Please Reply Box 2011, Modern Plastics.

CHEMIST OR CHEMICAL ENGINEER
Experienced in manufacture of vinyl floor tile. Excellent opportunity for personal advancement.
Reply Box 2031, Modern Plastics.

EXTRUSION—Experienced extrusion engineer or dye design man for established custom extrusion house. Should be capable of handling special set-ups, various shapes, compounds, and independent action. Location metropolitan New York. Send full information in first letter. Reply Box 2042, Modern Plastics.

PLASTIC CHIEF ENGINEER. Midwest injection molding plant doing Three Million Dollars requires experienced man responsible for estimating mold costs and mold design, production fixtures, customer product development and supervise all engineering functions. Salary commensurate with ability and experience. Unusual opportunity, work with management group. Confidential. Reply Box 2001, Modern Plastics.

ESTIMATOR—CUSTOM MOLDED PLASTICS COMPRESSION AND INJECTION AA-1 midwestern molder is expanding estimating staff and offers excellent opportunity to qualified man with broad experience in injection and compression operations. Apply in person or by mail to:
MICHIGAN
MOLDED PLASTICS, INC.
Dexter, Michigan.

## SITUATIONS WANTED

PLASTIC TOY MANUFACTURING EXECUTIVE AVAILABLE. Also Custom molding. Graduate Chemical Engineer, age thirty-two. Eight years high level successful technical, administrative, and business record of achievement with two major companies. Aggressive leadership and drive. Groomed and disciplined to meet competition and recession efficiently, economically, and intelligently. Reply Box 2004, Modern Plastics.

REINFORCED PLASTICS DESIGNER seeks position with progressive fabricator receptive to development of new product designs. Formerly held responsible position as chief designer in national organization. Varied experience as product designer in development of consumer and industrial products. Have compiled portfolio of new reinforced plastics products for consumer, industrial and architectural markets utilizing contemporary production techniques. Design degree, 30, married. Reply Box 2010, Modern Plastics.

NINE MAN ORGANIZATION travelling territory including New England, New York, New Jersey, Pennsylvania and south to Washington, D. C. We call on jobbers, chains and department stores. We invite correspondence to discuss fair volume plastic line of housewares, gifts or toys on commission basis. We are expert in fields of housewares, food markets and giftwares. Reply Box 2018, Modern Plastics.

GERMAN IMMIGRANT—age 32—five years experience, assistant to chief-chemist, in testing and developing: electro-insulating varnishes, plastics, molding-compositions as of laminated materials (on the base of phenol-cresol-formaldehyde-resins). Acquainted with all testing methods. Qualitative, quantitative analysis, (oil test, flashing-point and viscosity, boiler-feeding-water). Willing to relocate. Reply Box 2020, Modern Plastics.

CHEMIST: B.S. Fourteen years diversified and successful experience in resins, plastics, adhesives, coatings, paper, impregnation techniques, materials of construction, oil filters. Desires responsible, challenging position. Name your product—will develop or improve it. Age 37. Family. California location preferred, but will consider other areas. Please Reply Box 2025, Modern Plastics.

EXPERIENCED MAN AVAILABLE. Broad sales experience in thermoplastic field. Thoroughly conversant in estimating and tooling problems of injection molding. Well rounded background in directing engineering design and method improvements. Successful record of strengthening customer relations through improved service techniques. Capable administrator, skilled in providing solutions for new and challenging problems. Age 42, family. Reply Box 2035, Modern Plastics.

PLANT MANAGER, over 19 years in the Plastics Industry; experienced in all phases of plant operations including design, development, engineering, tooling, molding (thermosetting and thermoplastic), methods, purchasing, inventory control and production planning. Reply Box 2034, Modern Plastics.

DESIGNER AND CREATOR OF NEW IDEAS in models for Plastic molds. Familiar with Reinforced Polyester Resins. Well rounded experience in production molds and model making. Also experienced in making models and molds for slush casting in plastic and metal molds. Created and designed plastic animals for coin operated machine for Kiddy Rides. Desires permanent position with solid company offering future. New York City or North Jersey location preferred. Send replies to: MR. FRANK KRUPP, 46 Hillcrest Road, Mt. Vernon, N.Y.

PLANT ENGINEER OR MAINTENANCE SUPERINTENDENT with 27 years experience in: Vinyl, Plastisol, Pyroxylin Calendering and Coating; Solvent Recovery, Power House, Dyehouse; Lacquer, Corduroy Making. Conscientious Worker; Excellent References. Reply Box 2012, Modern Plastics.

TOOLING SUPERVISOR desires position with Reliable Progressive Company. 22 years of extensive experience in Plastic, Zinc Metal and Metal Stamping Molds and Dies. Past 12 years devoted to supervision. Experience includes Estimating, Designing and Set-Up of tools to point of production. I am 45 years of age and will relocate. Reply Box 2015, Modern Plastics.

REINFORCED PLASTICS: Versatile Industrial Engineer, experienced in reinforced plastics, can help your company boost profits through better administration. Able to improve shop & office methods, estimate, design, cut costs. A sales engineer you can count on. Wants to relocate with progressive company that's going places. Alert, energetic, on the ball! Reply Box 2037, Modern Plastics.

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CUSTOM MOLDING REPRESENTATIVE: Midwest custom molding company requires representation in Chicago and other midwest areas on commission basis. Reply Box 2006, Modern Plastics.

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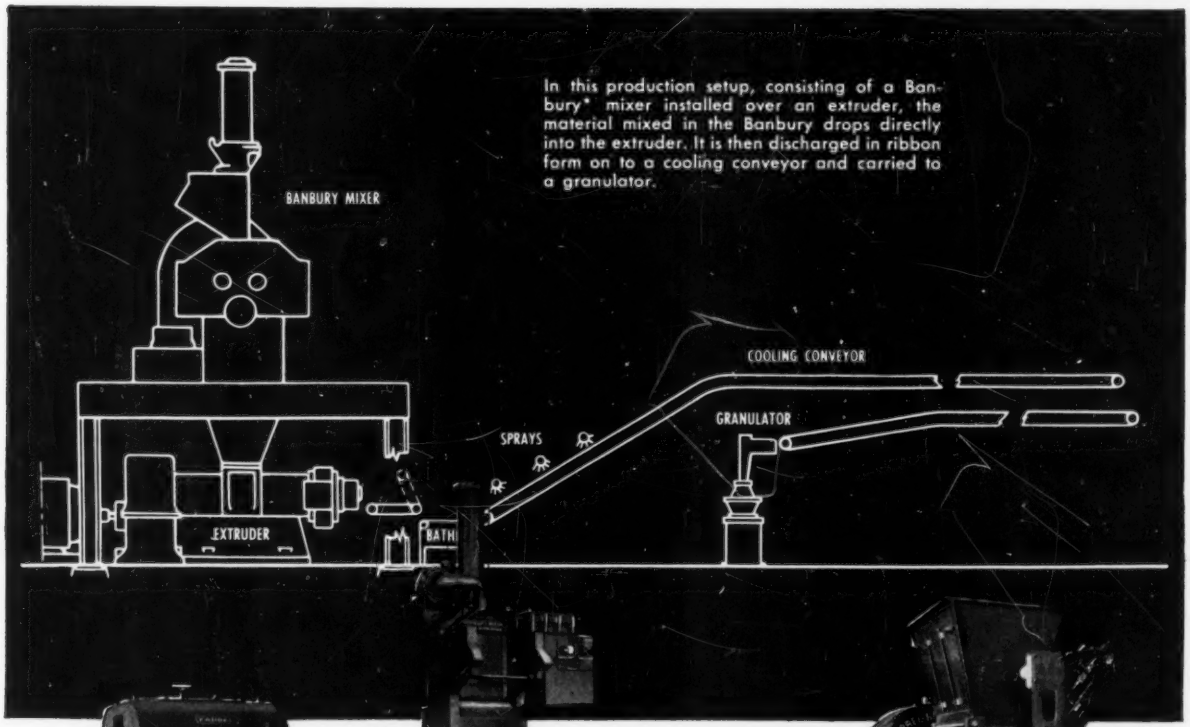
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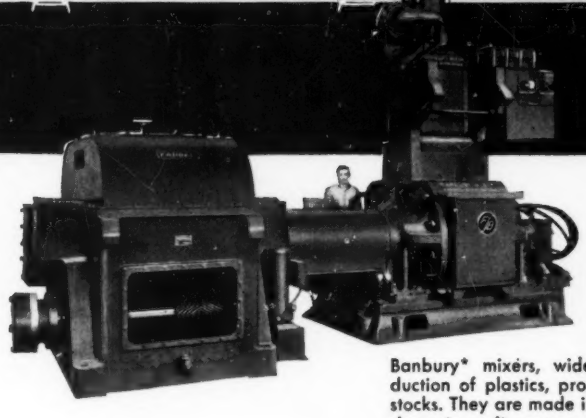
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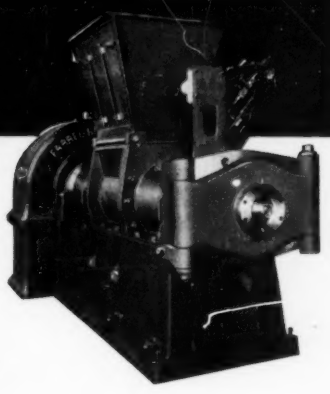
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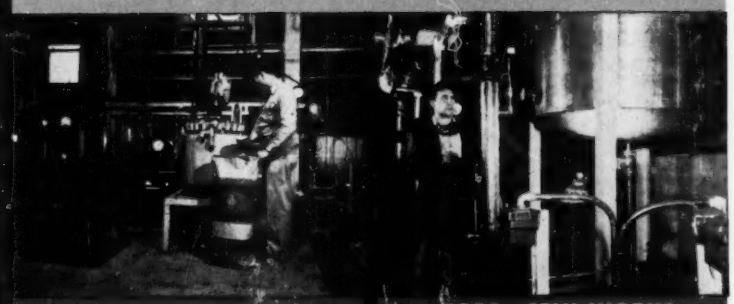
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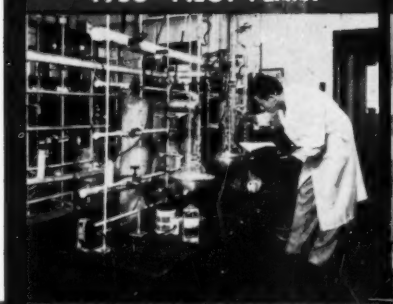
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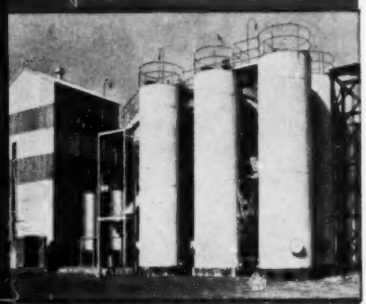
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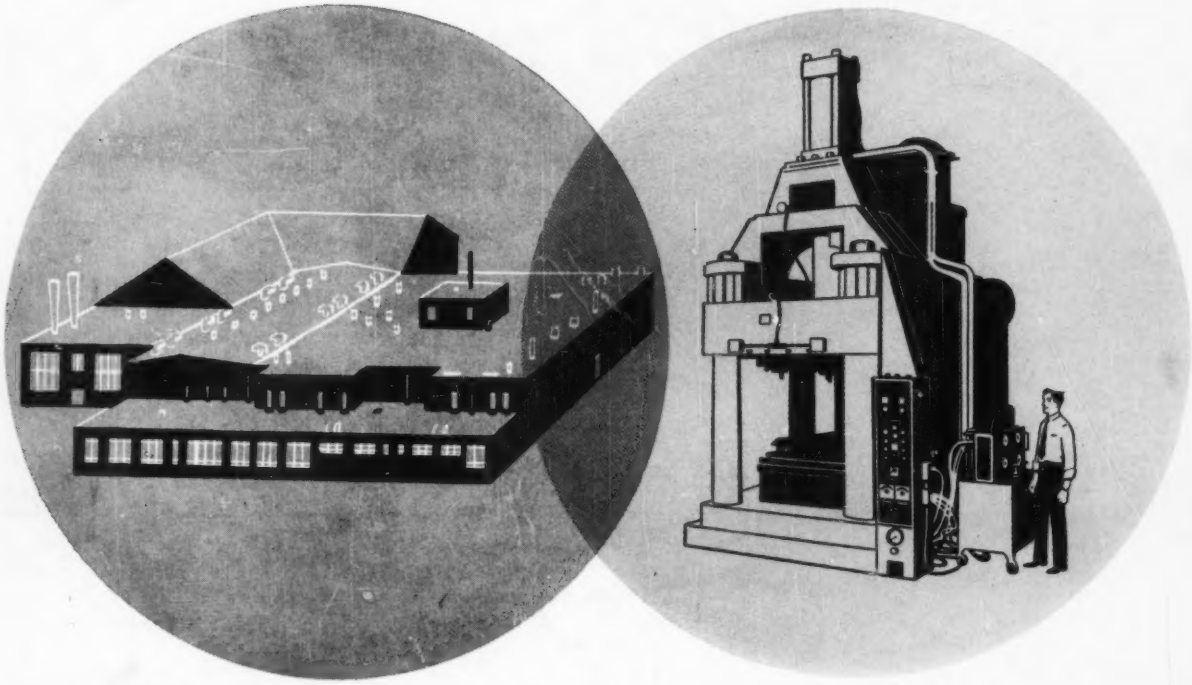
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